Plains Pest Management

Integrated Pest Management Program

Hale and Swisher County

<u>2022 Annual Report</u>

Prepared by:

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Extension Agent-IPM

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2022 Plains Pest Management Newsletters available at: https://hale.agrilife.org/newsletter-ipm/

Acknowledgements

A successful Extension IPM program hinges upon dedicated support, active participation, and a desire to advance and improve IPM practices from area producers, agribusiness, gardeners, and homeowners. Appreciation is extended to the participating members of the Plains Pest Management Association for their cooperation, support, and participation in the 2020 Plains Pest Management Program:

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Brenden Adams	Plains Pest Management, Field Scout
Denise Reed	Plains Pest Management, Secretary

Plains Pest Management 2022 Advisory Committee

Ronald Groves	Mike Goss	Jerry Rieff
Jimie Reed	Jimmy Sagaser	Joe McFerrin

2022 Plains Pest Management Ag & Research IPM

Blayne Reed, Extension Agent – IPM, Hale and Swisher Counties

Relevance

Production agriculture is the foundation of the economies of Hale and Swisher Counties. Pests continually threaten production agriculture and persistently develop to overcome existing control measures. Integrated Pest Management (IPM) is an affective and environmentally sound approach to pest management that uses a combination of evolving control practices to maintain economic and environmental stability in production agriculture. The Plains Pest Management IPM Program is an educational program that strives to educate producers about the latest IPM principles and help implement sound IPM control strategies into producer's operations in Hale and Swisher Counties.

Response

The Plains Pest Management Association, made up of 16 participating grower members and steered by a chairing committee and the IPM agent, made informing the producers in Hale and Swisher Counties about the latest agriculture IPM principles, control methods and options a priority in 2022. During the year the activities included:

Weekly field scouting for insect, weed, and disease problems of the 16 participating grower members' fields.

- (2,607.79 acres of all crops) were scouted over the 2022 growing season. Information from this weekly field scouting was shared, interpreted, and IPM solution recommendations given to the participating growers via scouting reports and direct interactions.

- Data generated from the field scouting, along with pertinent IPM research and successful recommendations were shared through the Plains Pest Management Newsletter weekly throughout the growing season and periodically during the offseason (16 issues, 325 weekly subscriber recipients) and though the weekly High Plains IPM 'Radio' Podcast (weekly April-September) with All Ag, All Day radio rebroadcast.

- Locally conducted 14 independent agriculture IPM related research trials and assisted with district and State IPM research trials with all resulting data rapidly disseminated through newsletters, social media posts, radio programs, newspapers, and direct interactions.

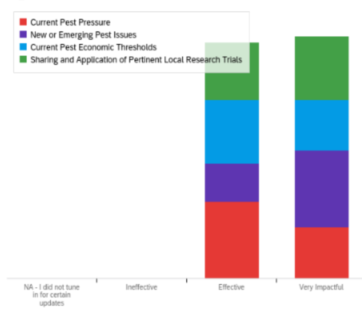
- Gave IPM presentations(in person and remote) at 9 grower meetings, 5 professional and peer meetings, 1 producer turn-row meeting, and a Field Scout School where IPM was a topic (19 CEUs offered from speaking). Made 2 Pest Patrol Hotline submissions summing a current pest situation nearing problem status area wide and gave IPM recommendations.

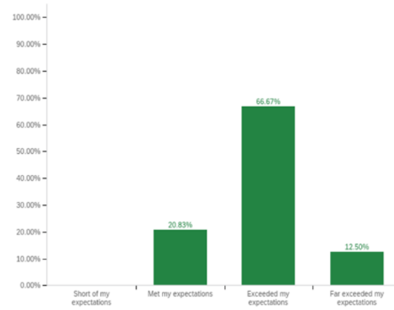
Results

A retrospective post evaluation instrument was distributed online to the subscribers of the Plains Pest Management Newsletter and was posted for all viewers of the Plains Pest Bugoshere (blog) and other social media outlets to interact with and respond to and participants in the field scout training days were polled for satisfaction following the conclusion of the season. Subscribers to the High Plains IPM 'Radio' Podcast were also evaluated voluntarily online retrospectively.

The 2022 Plains Pest Management online survey responders were made up of: **Ag Producers – 55.56%, Independent Ag Crop Consultants –7.41%, Ag Industry –25.93%, Ag Retail – 11.11%, Landlord, Homeowners, Gardeners & Horticulturalists – 0%.**

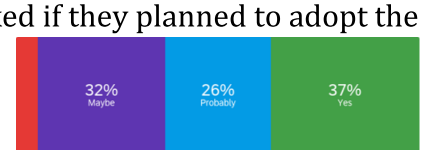
Responders were asked if the IPM educational efforts of the program had reduced their reliance upon pesticides in recent years. **100% responded yes.**
Respondents to the PPM Survey were asked to rate the Plains Pest Management IPM program performed during the 2022 growing season and how impactful the program was in education about the growing season's pest issues.





Responders were then asked if they could assign a per acre crop production $ value to all the combined major efforts of the Plains Pest Management Association's IPM program in Hale and Swisher Counties, what would it be? Responders were also asked to respond with how many acres their work in agriculture represent?
<u>The average value response was $60.30 per crop acre and represented 96,004 acres of all major crops grown in the area</u> (only ag producer and crop consultant provided acres are represented in these results).

Wheat pests emerged locally during the 2021-22 growing season that gave opportunities to re-evaluate the economics of certain pests treatments. The resulting research shown that a change in management was needed. Responders were asked if they planned to adopt the new recommendations based upon the new research. 63% responded yes or probably with only 5% responding no to the new IPM management adaptation.



Summary

These results indicate that the IPM Program in Hale and Swisher is proving to have both positive economic impacts and is advancing IPM education and thus ag sustainability in the area. If the survey responder estimated **$60.30 per production acre estimate** of the value of the IPM Program is multiplied by just **the survey responders represented production acres, a $5,789,041.20 potential IPM Program impact figure** emerges. Even if this conservative survey-based estimate proved to be high, the Plains Pest Management is still not only important to the production agriculture economy in the Hale and Swisher area but is a significant part of that economy's maintenance, function, and advancement. The high expected adoption rate of the reversed wheat IPM management practices based on the locally conducted research proves a standing trust from the ag community and the program.

2022 General Horticulture, Homeowner, Gardening, & Youth IPM Education

Blayne Reed, Extension Agent – IPM, Hale & Swisher County

Relevance

Pests affect all aspects of human life. Pests continually threaten production agriculture, stored grain, human health, households, and even the stored foods in our pantries. Meanwhile, these same pests persistently develop to overcome existing pest control measures. Integrated Pest Management (IPM) has a forty plus year history of proven environmentally sound and effective approaches to pest management by utilizing a combination of established principles and evolving specific control practices to maintain pest control. The Plains Pest Management IPM Program is an educational program that strives to educate the producers and citizens of Hale and Swisher Counties about the IPM principles and the latest IPM control methods to help implement IPM into our daily pest control strategies.

Response

The Plains Pest Management Association, made up of 16 participating grower members and steered by a chairing committee and the IPM Agent, made informing the general populace of Hale and Swisher Counties about IPM principles and implementation into our daily pest control habits one of the IPM Program's focus in 2022. The year's activities included:

- Direct non-ag customer interactions through site visits (18 with 42 contacts), insect ID (24), direct phone calls / emails (21) that involved IPM Education and solution recommendations and civic group presentations (2).
- Written newspaper articles and interviews (2) and blogs and other specially dedicated social media posts (12),
- Participation in Hale County Ag Fair for all 4th graders in Hale presenting "Entomology and You" (435 students). Presentations at youth organizations (2)
- 4-H Youth education: coaching the Hale & Swisher 4-H Entomology ID Teams (2 teams, 7 youth) with all contests. Texas 4-H Insect Photography State Contest Superintendent (72 contestants).

2022 Sr. Hale County Entomology ID Team (3rd Place State)

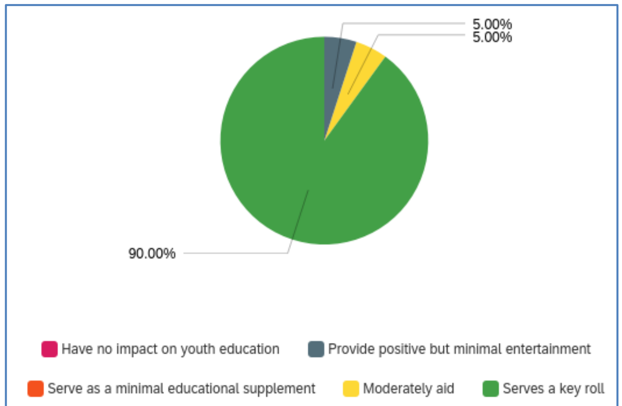
- Trained and managed 1 PPM intern for the summer 2022 season.

Results

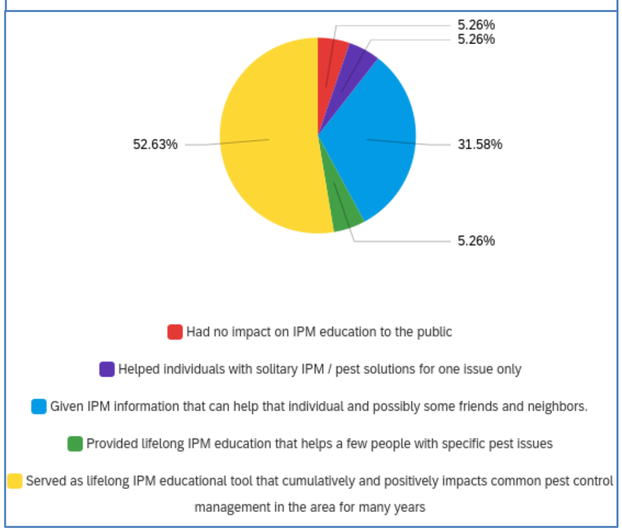
A retrospective post evaluation instrument was distributed online to the subscribers of the Plains Pest Management Newsletter and was posted for all viewers of the Plains Pest Bugoshere (blog) and other social media outlets.

The 2022 Plains Pest Management online survey responders were made up of: **Ag Producers – 55.56%, Independent Ag Crop Consultants –7.41%, Ag Industry –25.93%, Ag Retail – 11.11%, Landlord, Homeowners, Gardeners & Horticulturalists – 0%.**

In 2022 the IPM Program made several efforts in youth entomology education. youth IPM education, and agricultural advocacy efforts for youth. These efforts are viewed by the PPM steering committee as imperative in developing involved youth into tomorrow's leaders, scientists, agriculturalists, and professionals. The 2022 survey responders were asked how these efforts are perceived by the public:



The survey responders were also asked what impact the PPM efforts in one-on-one and adult educational program educational efforts in general homeowner, gardener, horticulturalist, and other non-ag customer efforts were having:



Summary

The IPM Program's efforts in horticulture, homeowner, gardening, and youth IPM education received high marks from the agriculture sector responders. 90% of survey responders indicated that the youth IPM education efforts serve a key role in developing tomorrows leaders, scientists, agriculturalists, and professionals. Over 94% of the responders indicated that they felt our adult IPM educational efforts at least helped the engaged individual while over 52% indicated that they felt the efforts made lifelong IPM educational efforts that cumulatively and positively impacts common pest control management in the area for many years. These results indicate success in our non-ag IPM education that should look to expand in scope if possible.

2022 Cotton In-Depth Managing Crops and Pests with Diminishing Resources

Blayne Reed, Extension Agent – IPM, Hale & Swisher County

Relevance

Production agriculture is the foundation of the economies of Hale and Swisher Counties, and irrigation has been a key component to that economy. Irrigation research and improved infrastructure have led to great advancements in improving irrigation water use efficiency and conservation on the Texas High Plains (THP) over the past 50 years. While these improvements extended the useful life of the Ogallala Aquifer for agricultural use into the 21st Century, there is no longer sufficient irrigation capacity to continue current acreage levels or amounts per acre of irrigation across much of the THP. The Plains Pest Management IPM Program is an educational program that strives to educate producers about the latest agricultural IPM principles and help implement sustainable management strategies into producer's operations in Hale and Swisher Counties.

Response

The Plains Pest Management Association, made up of 16 participating grower members and steered by a chairing committee and the IPM agent, made informing the producers in Hale and Swisher Counties about the latest sustainable conservation production practices and testing evolving principles a priority in 2022. During the year the activities included:

- Weekly field scouting for insect, weed, irrigation scheduling, and disease problems of the 16 participating grower member's fields (2,607.79 acres) were conducted over the 2022 growing season. The information generated, with special emphasis on crop water management and other conservation practices, from this weekly field scouting was shared, interpreted, and solution recommendations given to the participating growers via scouting reports and direct interactions.

- Data generated from the field scouting, along with pertinent research and successful recommendations were shared through the Plains Pest Management Newsletter weekly throughout the growing season and periodically during the offseason (16 issues, 325 subscribers) and through the weekly High Plains IPM 'Radio' Podcast (weekly from April-September) with All Ag, All Day radio rebroadcast.

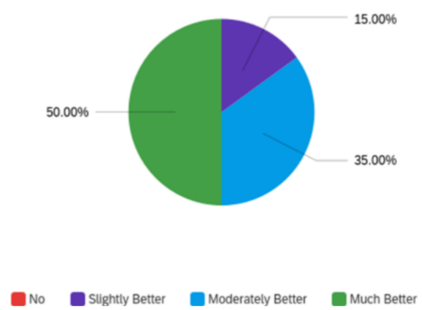
- Grants and other funding to conduct sustainable water conservation testing methods for the THP with applicable research partners are in use (5 - 2022 research trials). Dedicated field days (2) and articles for newsletters (10), newspapers (1), magazines (3), and mass media (11) were made targeting new conservation methods, IPM impacts of implementation, and research results were shared.

Results

A retrospective post evaluation instrument was distributed online to the subscribers of the Plains Pest Management Newsletter and was posted for all viewers of the Plains Pest Bugoshere (blog) and other social media outlets to interact with and respond to.

The 2022 Plains Pest Management online survey responders were made up of: **Ag Producers – 55.56%, Independent Ag Crop Consultants –7.41%, Ag Industry –25.93%, Ag Retail – 11.11%, Landlord, Homeowners, Gardeners & Horticulturalists – 0%.**

The 2022 PPM survey responders were asked if they felt the educational efforts in crop management with diminishing resources **are they better prepared them to meet future challenges**?



Responders were then asked if they could assign a per acre crop production $ value to all the combined major efforts of the Plains Pest Management Association's IPM program in Hale and Swisher Counties, what would it be?

The average value response was $60.30 per crop acre for 96,004 production acres for a total value of $5,789,041.20.

Harvesting research plots in 2022.

At the Mid-Plains Ag Expo Producer meeting held in Plainview, managing crops with reduced resources for sustainability was an educational topic from multiple sources. A retrospective post evaluation was given to the attendees. The responders indicated a **37.0% increase in understanding of precision irrigation technology**, a **42.7% increase in understanding of soil carbon capture**, and a **31.3% increase in understanding of IPM situations are impacted by environmental situations**.

Summary

The IPM Program in Hale and Swisher Counties is proving to have real value and impact in the Hale and Swisher production agriculture economy, including preparing the regional producers to deal with reduced water resources.. A solid **100% of the PPM survey responders indicated that they would be at least slightly better prepared for future diminishing water resource issues due to these educational efforts** with 85% expecting to be moderately or much better prepared. With 2023 grant and other dedicated local research funding approved for another year, additional education, demonstration, and hypothesis testing efforts to better aid producers with managing THP crops with diminishing water resources sustainably will be revisited and educational outlets expanded.

Managing Grain Pests InDepth 2022

Blayne Reed, Extension Agent – IPM, Hale & Swisher County

Relevance

Agriculture is the foundation of the economies of Hale and Swisher County. Grain from wheat, corn, and sorghum are among the main commodities grown in this diverse production agriculture system while pests of these crops remain a constant threat to profitability and the stability of our food supply.

Response

A select group of producers, through a partnership with Texas A&M AgriLife Extension, Texas A&M Entomology, and Texas Pest Management Association formed and maintain Plains Pest Management in Hale and Swisher Counties for the purpose of Integrated Pest Management (IPM) education and implementation. IPM is a key production practice that will increase agricultural profitability while maintaining sustainability in pest control. With area producer interests in grain production high and expenses increasing for 2022 IPM education in grain crops helps maintain sustainability.

- Conducted 5 independent and locally conducted IPM related sorghum, corn, and wheat insect trials over 2022. Shared results rapidly through newsletters, blogs, radio programs, grower meetings and direct interaction and professional conferences with complete write ups available through annual IPM Unit Report (https://hale.agrilife.org/ipm-2/)

- Weekly field scouting and crop consulting of the participating grower member's corn and sorghum fields with survey scouting of regional wheat was conducted over the full 2022 growing season. Information from this field scouting was shared, interpreted, with IPM solution recommendations given to the participating growers via scouting report and other direct interaction.

Early BGM colony in corn.

- Data generated from the field scouting, along with IPM alerts, how to scout, economic thresholds, and IPM recommendations were shared through the Plains Pest Management Newsletter weekly throughout the growing season (16 issues, 325 weekly subscribers with additional social media dissemination). Information was also shared through the High Plains IPM Podcast (6–10-minute releases weekly from April-September) with All Ag, All Day radio rebroadcast.

- 7 grain specific presentations (in person and remote) at grower meetings, 2 professional and peer meetings, and training at 1 Field Scout School were given (10 CEUs offered). Made 1 grain related Pest Patrol Hotline alert (text alerts), made 4 grain specific All Ag, All Day 6-minute radio spots.

-

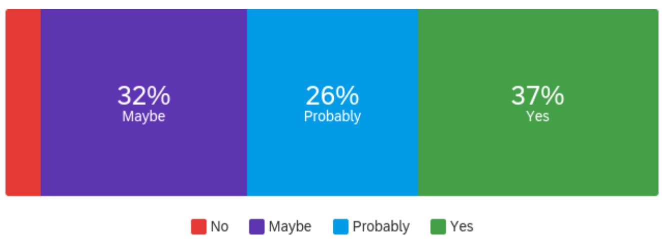
Results

A retrospective post evaluation instrument was distributed online to the subscribers of the Plains Pest Management Newsletter and was posted for all viewers of the Plains Pest Bugoshere (blog) to interact with and respond to.

The 2022 Plains Pest Management online survey responders were made up of: **Ag Producers – 55.56%, Independent Ag Crop Consultants –7.41%, Ag Industry –25.93%, Ag Retail – 11.11%, Landlord, Homeowners, Gardeners & Horticulturalists – 0%.**

- Responders were asked if the IPM educational efforts of the program had reduced their reliance upon pesticides in recent years. **100% responded yes.**

Wheat pests emerged locally during the 2021-22 growing season that gave opportunities to re-evaluate the economics of certain pests treatments. The resulting research shown that a change in typical field management was needed. Responders were asked if they planned to adopt the new management recommendations based upon the new research. 63% responded yes or probably with only 5% responding no to the new IPM management adaptation.



Responders were then asked if they could assign a per acre crop production $ value to all the combined major efforts of the Plains Pest Management Association's IPM program in Hale, & Swisher Counties, what would it be?

- The average value response was **$60.30 per crop acre** for the 2022 growing season._The survey responders represented 20,400 acres corn, 12,520 acres sorghum, and 15,000 acres wheat. This calculates to an area economic return for each crop of **$1,230,120 to area corn, $754,956 to area sorghum, and $904,500 for wheat.**

A retrospective post survey from the ag producers meeting, Mid-Plains Ag Expo, held February 8th in Plainview was given to all attendees. For the presentation "Understanding IPM issues for 2022" the attending responders indicated a **70.6% increase in subject understanding** while **77.8% intended to adopt at least one new recommended IPM management technique**.

Summary

These results indicate a level of success in IPM methodology adoption, both through locally conducted research and new information dissemination, successful educational outlets in releasing information, and measurable economic impacts benefiting the region. The survey responder estimated **$60.30 per production acre estimate** of the value of the IPM shows lasting economic benefits, while rapid adoption of evolving IPM strategies indicate a successful education plan from the program.

2022 Educational Activities

Farm and Site Visits	604
Number of Newsletters Released	16
Newsletter Recipients	6,240
Direct Contacts	17,862
Radio Programs	30
Blog Releases	86
Ag Consultants, CEA, and Field Scouts Trained	21
Newspaper / Magazine / online Magazine articles (written or interviewed)	8
Research Trials Initiated	16
Research Trials Supported	14
Professional Presentations	2
Presentations / Programs / Field Days Made for Adults	12
Presentations Made to Youth	8
Pest Patrol Hotline Alerts	3
High Plains IPM 'Radio' Podcasts	25

Activity Highlights

Plains Pest Management Scouting Program
(2,607.79 acres)
Applied Research Projects
All Ag, All Day Radio Programs
Hale & Swisher 4-H Youth Entomology Projects
Horticulture IPM Spot Checks
Hale County Youth Ag Fair
High Plains Association of Crop Consultants
CEU training & County Meeting Support
Texas Pest Management Association
Agent Trainings
FOCUS on South Plains Agriculture
Newspaper Press Releases
West Texas A&M University Guest Lecture
Cotton Incorporated TSSC Grant

Plains Pest Management Newsletter
Plains Pest Management Bugoshere (blog)
Hale & Swisher Ag Day
Progressive Growers Breakfasts
Entomological Society of America
Field Scout Schools
Pest Patrol Hotline
4-H Entomology ID Teams
Corteva Innovations
High Plains IPM 'Radio" Podcast
Hale, Swisher, & Floyd Cotton Field Day
Southwestern Branch ESA Symposia Host
Texas 4-H Entomology Photography Contest
Superintendent
Southwestern Cotton Physiology

2022 at a Glance

The following is a brief overview of the 2022 growing season and pest populations in Hale & Swisher County agricultural crops. Copies of the Plains Pest Management Newsletters published in 2021 are available at https://hale.agrilife.org/newsletter-ipm/ for a more in-depth look at specific pest pressure, weed situations, crop conditions, and environmental conditions at any given week of the growing season. Each growing season is unique, and the weather and pest of 2021 on the High Plains were no exception.

The 2022 season was predominated by extreme drought conditions. Limited wheat was planted in the dry 2021 fall season and the year began with a heavy reduction in irrigated wheat and pasture calves. Very few dryland acres established. Little to no winter and spring moisture added more direness to the situation. As winter ended field after field of quickly became untenable via irrigation capacity alone with the majority of wheat acres, even irrigated, being abandoned due to drought. Those that were not abandoned experienced a focused activity of pests, including pockets of Russian wheat aphids. High numbers of wheat curl mites were widespread on drought stressed wheat. Producers moved to salvage the few remaining fields but outside circumstances limited chemical control availability to control the aphids or mites. Research was conducted to evaluate experimental Russian wheat aphid product and mite in wheat products, neither yielding acceptable options. However, the mite trials revealed that the wheat curl mite was not an economic secondary feeding pest and should not be considered for chemical control options unless for disease vector reasons in the fall.

Only about 5% of the area's average wheat acres survived to harvest, either for grain or forage, with yields producing about 1/3 of average. Moisture conditions did not improve for Summer crop planting timeframe with most April and first 2/3 of May plantings being made dry or with very limited pre-irrigation or early stand establishment irrigation investments due to a rapidly decreasing pumping capacity for the region and increasing energy costs. Given the drought situations at the time and market forces, cotton was vastly favored over any summer grain or hay crop for both irrigated and dryland acres for a first planting. Toward the end of May most areas in Hale and Swisher received between 0.75 and 2.5-inches moisture that aided in the establishment of irrigated acres but proved to be not enough to aid in establishing dryland acres with most of those fields desiccating or otherwise failing before mid-June.

The resulting summer crop production acres had no dryland and a 60% to 75% reduction in first planting, exact location depending, successfully established irrigated acres from an average planting year. With the drought conditions extending well into the summer months, all of the failed dryland and most of the failed irrigated acres remained fallow until fall with likely only an additional 20% to 30% being replanted to forage or sorghum for grain. Field abandonment of both plantings continued through the summer months as dry conditions continued and irrigation systems were outpaced or failed.

Pest pressure was reduced for most species but present for the full season. Early thrips pressure in irrigated cotton was average for most acres early with about 95% of established fields requiring treatment above the standard seed treatment. About 20% of area fields also required treatment for fleahoppers or Lygus. The existing pest pressure eventually focused on well irrigated acres with very little insect activity found in the majority of fields that were struggling to keep up with moisture demands through the summer. Bollworm migration was very light for the year and most of the resulting population focused on a present but greatly reduced amount of late corn acres. Egg lay was only recorded in the lushest of cotton with no area fields known to have reached economic levels.

Some very light spider mite populations were recorded in heat stressed irrigated fields but neither they nor any other pests of note threatened the surviving cotton for the season.

The few corn and sorghum acres were under drought stress, a factor that is known to better support mite populations in these grass crops. In typical fashion, for the majority of the season and Banks grass mite populations were unusually high with about 90% of area corn reaching economic levels and an unusually high percentage, around 40%, of sorghum needing treatment as well. The sorghum aphid was slow to migrate into the area and infest and develop on sorghum. A reduced number of acres, only around 40%, required treatment, continuing a trend from previous seasons. A few headworms were present and a population of fall armyworms were tracked all season in sorghum, but did not become problematic.

The extreme drought conditions stretched over the full growing season with only a few pockets receiving any moisture until late August and early September. This rain event was sizable at between 1 and 4-inches but occurred well after all summer crops had reached cut-out or physiological maturity. These rains were of no benefit to the summer crops. Summer yields were reduced by an average of 30% to 70% depending upon rainfall pocket or irrigation capacity. Very few fields yielded at least average yields and even fewer could be considered high, but some were present, usually those with the highest irrigation capacity with the best efficiency.

While the late summer and early fall rains did not help the summer crops, it did provide adequate moisture for early wheat planting. The vast majority of summer failed irrigated acres and most failed dryland fields were planted to this early season wheat. Wheat seed was in short supply due to the previous year's failed acres but also outside production issues. While producer's preferred variety could not be found, differing wheat seed options were found at a higher price with acres successfully established. Much of these acres were also planted without seed treatments well before frost dates. Insect and other arthropod disease vectors did establish at a fairly high rate on these less desired and unfamiliar lines of wheat with a high occurrence of disease issues. Limited winter moisture has kept the majority of these acres relevant and providing cover, forage, and grain yields remain hopeful as the area moves into 2023.

2022 Applied Research Projects

2022 Sentinel Plot Monitoring of Bollworm, Helicoverpa zea, Resistance to Bt Technologies in Cotton on the Texas High Plains

Finding Sustainable West Texas Agriculture Production with Diminished Irrigation Through Establishing Dryland, 2022 year 1 of 3

2022 Population Monitoring of Adult Bollworms in Hale & Swisher County

2022 Bollworm, *Helicoverpa zea*, - Pyrethroid Resistance Survey in Hale & Swisher County

Auxin Spray Tip Impact on Early Season Thrips Control in West Texas Cotton 2020, 2021, and 2022

2022 Oberon Banks Grass Mite in High Plains Corn Efficacy Trial

2022 Portal Formulation Efficacy Trial on BGM in Corn

Economic Evaluation of Brown and Wheat Curl Mites Management and Experimental Control Product Efficacy in Texas High Plains Wheat

2022 Sentinel Plot Monitoring of Bollworm, Helicoverpa zea, Resistance to Bt Technologies in Cotton on the Texas High Plains

Texas A&M AgriLife Extension Service
Texas Mid-Plains Region
Cooperator: Clay Golden
Blayne Reed, EA-IPM Hale & Swisher, John Thobe, EA-IPM Parmer, Bailey, and Castro, and Tim Culpepper, BASF

Summary

With confirmed Bt technology resistance confirmed, each year the need for monitoring resistance in Bt cotton at the local level increases. A Fibermax large plot cotton variety trial near Aiken, Texas, in northwestern Floyd was utilized for this Sentinel Purposes. A non-Bt line, FM 2202 GL, a TwinLink (Cry1AB+Cry2Ae) line, FM 2498 GLT, and a TwinLink Plus (Cry1AB+Cry2Ae+Vip3A) line, FM 2398 GLTP were chosen for resistance screening. Data collection began with weekly counts of 50 whole plant inspections, 100 boll inspections, 100 square inspections, and 50 white flower inspections per technology beginning at first bloom and continuing weekly until absolute cut-out stage of 3.5 NAWF.

Under no metric were any traits under economic pressure from bollworms. These results do confirm resistance to the Cry1AB+Cry2Ae traits but that some level of field control is exhibited by all available Bt traits. These levels are not absolute but should reduce damage under light pressure situations, perhaps even preventing treatment. The Cry1AB+Cry2Ae trait technology combination offered a 3.2% reduction in bollworm damage to harvestable fruit over the bollworm season when compaired to the non-Bt line while the addition of the Vip3A trait offered a 4.5% reduction. These proportions are very similar to bollworm resitance studies across the Cotton Belt. While a benefit in reducing worms and damage, nether technology remains strong enough to prevent economic bollworm

situations under heavy pressure from forming in the Texas High Plains. All cotton fields, regardless of Bt trait, should be scouted accordingly.

Objective

Evaluate efficacy and level of economic return of non-Bt and all Bt trait technologies on bollworms in West Texas commercial cotton and compare these results to other Bt/bollworm resistance studies across the US Cotton Belt for any clues regarding potential regional differences and resistance hotspots.

Materials and Methods

A Fibermax large plot cotton variety trial near Aiken, Texas, in a northwestern Floyd drip irrigated field was utilized for these Sentinel Plot Trial Purposes in 2022. All planting, agronomic and IPM inputs were managed by the cooperating producer and Clay Golden Consulting. A non-Bt line, FM 2202GL, a TwinLink (Cry1AB+Cry2Ae) line, FM 2498GLT, and a TwinLink Plus (Cry1AB+Cry2Ae+Vip3A) line, FM 2398GLTP were chosen for this bollworm resistance monitoring effort.

Data collection began with weekly counts of 50 whole plant inspections, 100 boll inspections, 100 square inspections, and 50 white flower inspections per technology beginning at first bloom and continuing weekly until final bloom for a total of seven weeks of data collection. The first count date occurred on 18 July and the last on 30 August.

Figure 1. PPM Field Scout, Brenden Adams, helping gather the 2022 data.

Field stand counts in terms of plants per acre were taken from 1/1000th of an acre from all lines utilized were taken on the first check date which resulted in 29,000 PPA. For commonality with local bollworm ET standards and in sharing resulting data with producers regionally, all resulting bollworm whole plant inspection data was converted calculated with the plants per acre data and converted into bollworms per acre. All resulting damaged fruit data was also converted into percent damaged fruit for commonality with the new Cotton Beltwide ET of 6% harvestable fruit damage. Foliar feeding larva species such as cabbage loopers, beet armyworms, true armyworms and others were also recorded in terms of larva per acre.

Results and Discussion

All bollworm populations were light again for the 2022 evaluation with no Bt technology reaching economic threshold levels by any metric.

In terms of bollworm larva per acre, only the non-Bt line held any worms for the first 5 weeks of the data collection. On the 2nd check week, 25 July, only 580 bollworms per acre were found on the non-Bt and again on 15 August. On the 23 August data collection data bollworms were found in both the non-Bt and the two trait line. The non-Bt held a mix of small and medium sized worms resulting in 1,740 bollworms per acre while the two trait line held only 580 small worms per acre. On the last data collection date, only the two trait line held bollworms, again at 580 small worms per acre. No bollworms were found in the 3 trait line, containing the Vip3A trait, for the entirety of the data collection period.

In terms of percent harvestable fruit damaged by bollworms, damage was foundin the non-Bt line and the 2 trait line on the 18 July collection date but no more damage was found in any line until three weeks later on the 15 August date. For the 15 and 23 August collection dates, all lines had some level of bollworm damage found. On the last check date, only the non-Bt line had any bollworm damage found. The high bollworm damage check occurred on the 23 August check date when the non-Bt line exhibitied 3.3% damage, the TwinLink line exhibited 2.5% damage and the TwinLink Plus exhibited 1.6% damage.

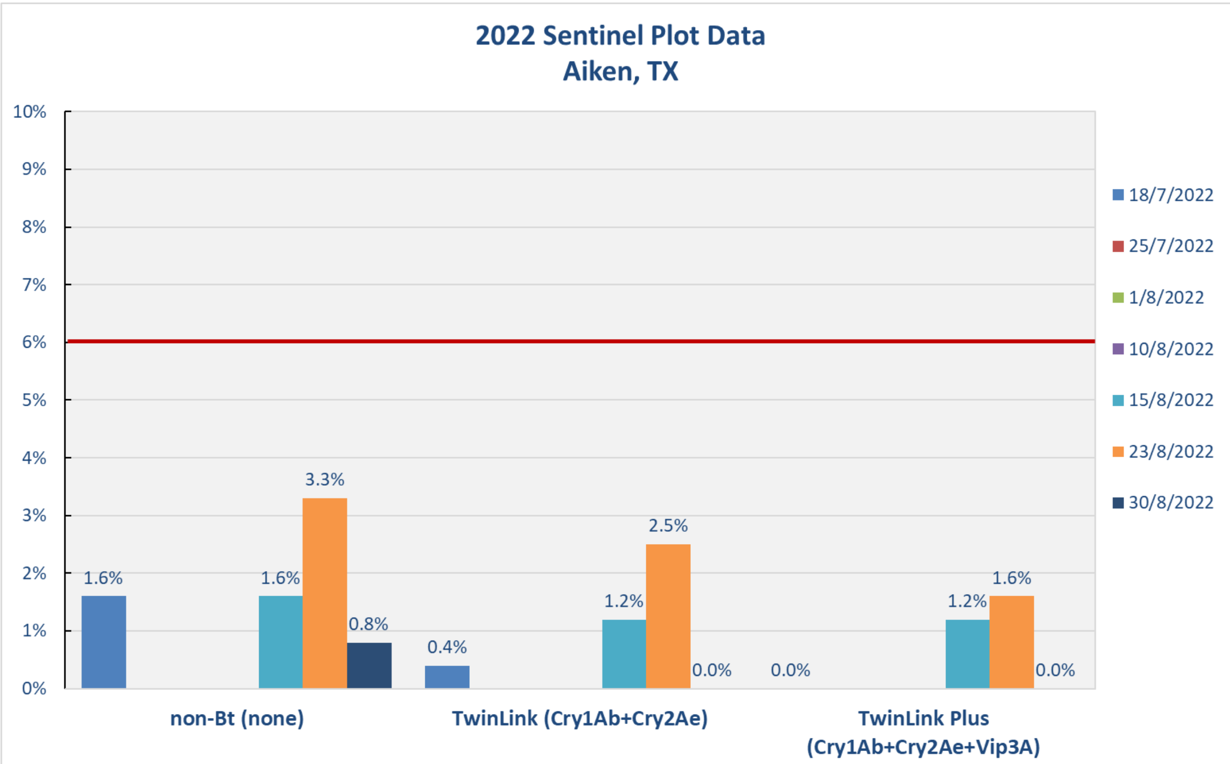


Figure 2. Bollworm percent damage to harvestable fruit by Bt trait over time.

In terms of all other Lepidopteran cotton pests, cabbage loopers represent the only species found in the 2022 season. The larva were found only in the non-Bt line on the 25 July date and the 30 August date, both at 580 worms per acre. Both Bt trait combinations continue to show outstanding control of other Lepidopteran pests.

Conclusions

Despite a light bollworm pressure population for this evaluation there was enough pressure to capture meaningful trait performance data representative of bollworm control in the region.

These results show that some level of field control is exhibited by all Bt traits but not at absolute levels that would prevent economic damage under higher pressure situations. These results also indicate an increase in bollworm control when the Vip3A trait is added to the Cry1Ab and the Cry2Ae traits. These results agree with lab and field bollworm resistance studies from across the cotton belt. Even the proportion of control offered by the varied traits over the non-Bt trait remains similar if not identical regarless of location. It is common that under heavier pressure, the 2 trait technology can and often does reach economic levels in cotton exhibiting fewer worms and damage than the non-Bt. The increasing of bollworm control from the Vip3A trait over the 2 trait technology is well documented and not new for the 2022 season. The finding of some level of damage as well as surviving worms in the Vip3A trait is new, indicating and agreeing with lab and other field studies in that the resistance level to the Vip3A trait is increasing but is not at a failure level yet. While we still should expect a higher level of control from Vip3A over the 2 trait technology, these results indicate that even the Vip3A trait could reach economic levels with high enough bollworm pressure. All available Bt traits, while still offering reductions and benefits in bollworm control in cotton, should all be scouted for economic bollworm populations equally.

The foliar pest data indicates that the TwinLink and TwinLink Plus traits both still offer outstanding and likely complete control of these pest species.

We can also infer from these results that bollworms will not be an annual economic cotton pest on the Texas High Plains. Most areas of the cotton belt have adopted new economic thresholds for bollworms in response to Bt resistance, which include chemical preventative treatments triggered by egg lay for all Bt lines. These results show that the High Plains does not consistently have enough bollworm pressure to adopt these extreme measures of prophylactic chemical treatments. Instead, the High Plains likely should extend the existing economic threshold of 8,000 small bollworms, 4,000 medium or larger bollworms per acre or the 6% harvestable fruit damage to all Bt lines due to the likelihood of some level of resistance.

Acknowledgements

This work is supported by Crops Protection and Pest Management Competitive Grants Program [grant no. 2017-70006-27188 /project accession no. 1013905] from the USDA National Institute of Food and Agriculture. I would like to extend thanks to our cooperating producer Clay Golden for working with us to gather this data, BASF for sponsoring this trial, and John Thobe, EA-IPM Parmer, Bailey, and Castro for partnering in this work. I would like to thank the 2022 Plains Pest Management Interns for data collection and labor associated with this work: Brenden Adams and Denise Reed. Thank you all.

Finding Sustainable West Texas Agriculture Production with Diminished Irrigation Through Establishing Dryland

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Texas A&M AgriLife Extension Service / Cotton Incorporated
Swisher and Hale County
Jeremy Reed, Cooperator

Summary

Results of year 1 or 3 in a grant evaluating practical implementation of establishing dryland. Three moisture treatments, irrigated, established dryland, and dryland, were arranged on a pivot and corner belonging to Reed Farms on the Hale and Swisher line. The irrigated and established dryland portions of the pivot consisted of 45 acres each, both under the pivot. The dryland consisted of a 12-acre adjacent corner. All three treatments were planted in mid-to late May. Following planting, all treatments received 1.68-inches of rainfall. 3 Acre inches were invested in establishing the established dryland treatment, 4 in the irrigated treatment, and none in the dryland. Data collection began 31 May with stand counts and continued through harvest. The irrigated treatment received 10.2-inches irrigation, and both the dryland and established dryland only received the 0.87-inches of effective rainfall the fell in the balance of the remaining growing season.

The first year of the Finding Sustainable West Texas Agriculture Production with Diminished Irrigation Through Establishing Dryland had mixed results. With only 0.3-inches pre plant rainfall for the year, the situation was tough. We did successfully establish the dryland plant stands in this extreme situation with only 3-inches irrigation invested in establishment while the traditional dryland failed to establish. This did allow better focusing and scheduling of available irrigation water to the irrigated treatment. This also proved that dryland can be more reliably established by this type of early season split pivot use than the regional standard for dryland of 4 out of 10 seasons, with the dryland treatment failing to establish on rainfall alone. The additional 2.5-inches rainfall that came during crop development, none of which fell in key developmental stages, was simply not enough to justify having either dryland treatment or, with current input levels, was not enough for the supplemental irrigation focused (10.2-inches irrigation) on the irrigated side to make target yields. It is expected through these results that establishing dryland would increase stand establishment rate to 8 out of 10 years. With more normal rainfall seasons offering 7 to 10-inches of in-season rainfall, more sustainable yields for both the focused irrigation and established dryland could be had.

The results from both the Irrigated and Established dryland RACE trial results held within the larger trial may be found at: https://amarillo.tamu.edu/files/2023/01/2022-Texas-Panhandle-RACE-Trials-Report-1.pdf

Objective

This proposal's core hypothesis is to demonstrate how Texas High Plains (THP) Producers might profitably be able to navigate into a research proven, irrigation limited sustainable West Texas production system while reliably testing details of best management low-input practices and evaluating economic and environmental impacts. It is not designing a new system, but rather is intended to support proven evolving research for THP dryland production, irrigation scheduling, soil moisture conservation techniques, and promote a move toward sustainable West Texas production agriculture with less irrigation while rapidly adopting techniques that extend the life of the Ogallala.

Materials and Methods

Objective 1 – assessing the viability of establishing dryland with split use pivot for irrigation sustainability:

All three treatments, irrigated, established dryland, and dryland were planted in mid-to late May. The dryland corner was dry planted a few days before the irrigated and established dryland and the cotton variety trials within (see objective 2 for full detailed soil analysis, RACE trial results and full climate data).

Following planting on the night of 23 May and morning of 24 May, 1.68-inches of rain fell offering a total of 1.98-inches moisture for the pre-emergence moisture total. Weekly scouting of all fields began on 31 May by the Plains Pest Management scouting program. On 7 June, all possible seedlings had established for all fields and final stand counts for the full fields were taken.

The true dryland treatment field and the established dryland treatment field were planted at 24,500 seed per acre with the established treatment receiving an additional 2-inches irrigation 5 days before planting and 1-inch post planting above the 1.68-inches of rain following that fell the night after planting. The irrigated portion was planted at 50,000 seed per acre and received 2-inches preplant at the same time as the established treatment and 2-inches at the same time as the established 1-inch, also in addition to the 1.68-inchs of rainfall that fell the night following planting.

Table 1. Irrigation amounts by field treatment type and plant stage.

Irrigation - in inches	Irrigated Field	Established Dryland Field	True Dryland	
May	2	2	0	preplant
June	2	1	0	establishing-vegetative
July	3.75	0	0	Squaring-early bloom
August 1-15	2.5	0	0	Bloom -cutout
Total	10.25	3	0	

Table 2. Rainfall amounts by treatment type and plant stage.

Effective rainfall - in inches	Irrigated Field	Established Dryland Field	True Dryland	
May	1.68	1.68	1.68	preplant
June	0.3	0.3	0.3	establishing-vegetative
July	0.4	0.4	na	Squaring-early bloom
August 1-15	0.17	0.17	na	Bloom -cutout
Total	2.55	2.55	1.98	

Table 3. Total available effective seasonal moisture by treatment type.

Total available moisture for crop in season	Irrigated 12.8	Established Dryland 5.55

Reed Farms were unable to follow ideal recommended irrigation scheduling due to the dire situation of the drought conditions. Ideally, the July time frame for squaring-early bloom should have received only 2-inches and the later season and boll set period of August 1-15 should have received 4.25-inches during this peak water use timeframe.

Objective 2 - Evaluate agronomic inputs of established dryland compared to a direct shift to traditional dryland from full irrigation and the impacts on soil health:

The two Swisher County Cotton RACE Trials, dryland and irrigated, were planted under the irrigated and established dryland treatments to evaluate varietal agronomic traits under both treatments. Cotton plots were planted on 23 May with Jeremey Reed's 16-row planting equipment and Jourdan Bell's field team. The research site Pullman clay loam soil with a 0-1 percent slope. Soil samples and plant stands were collected 28 June, approximately 4-weeks post emergence. Three soil samples were randomly collected at 0-6-, 6-12-, and 12–24-inch depths in both the irrigated and established dryland treatments for a complete soil analysis. Soil salinity is of particular interest at this field site because of the deficit irrigation and the concern about salts accumulating at a greater rate in the established dryland system. Soil aggregate stability, an indicator of soil health, was measured (0-8 inch depth) in both irrigation treatments using the Ward lab modified wet sieve method.

Both RACE trials were ExtendFlex only trials due to cooperator management needs. Lines selected for the irrigated treatment included NG 3299B3XF, DP 1908B3XF, DP 2127B3XF, DP 2115B3XF, ST 4993B3XF, NG 3195B3XF, DP 1822B3XF, and DP 1820B3XF. Lines selected for the established dryland treatment included NG 3299B3XF, ST 4993B3XF, DP 1820XF, NG 3195B3XF, DP 2123B3XF, DP 2012B3XF, DP 1822XF, DP 1909XF. Weekly scouting of all agronomic data was performed by the Plains Pest Management scouting program with recommendations made to Jeremy Reed, cooperating grower who made all agronomic inputs for both trials. Harvest occurred on 1 December by Reed farms with samples and weights captured by Jourdan Bell's field team.

In-season rainfall totaled 7.34 inches, but 4.29 inches was received from 18-21 August well after absolute cut-out and after the any crop treatment could take advantage of the late moisture.

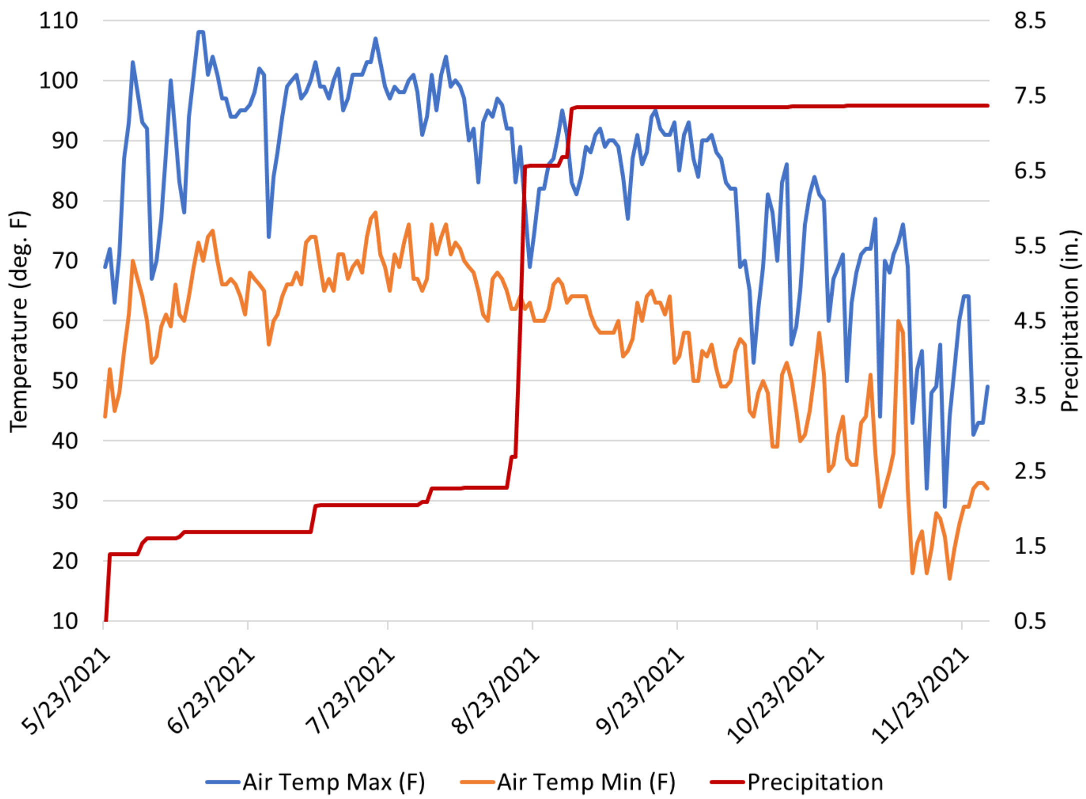


Figure 3. Temperature (day and night) with precipitation for all treatments over time.

Objective 3 - Evaluate insect pest populations and re-evaluate pest thresholds for best IPM practices and sustainability under all irrigation treatments.

All field scouting for all pest, agronomic, weed, disease, and irrigation scheduling were conducted by the Plains Pest Management field scouting program, contributing to all trial objectives. Scouting began on 31 May, one week after planting. All field recording and reporting were conducted utilizing the

CropWIse Protector program app through agreement with Syngenta. Through the use of CropWise Imagery, satellite images were captured of all three treatments were every 2-4 days for the growing season.

Through the use of these apps and field scouting, weekly evaluations and reports were captured for all pests, agronomic stages, weeds, and diseases in field for the entire growing season and recommendations given to Reed Farms and Jeremy Reed for overall inputs for the treatments.

Objective 4 – Help identify potential best management references for shifting irrigated acres to established dryland production through small plot trials within larger irrigation treatments.

A small plot minimal plant per acre for profitability and target yield by input trial was designed and implemented under the irrigated treatment and the established dryland treatment. For both the irrigated and established dryland fields, four plant populations were organized into a small plot CRBD with 4 replications. All plots were 4, 40-inch rows by 30 feet long. On 23 May 16 rows were planted in both the irrigated field and established dryland field 2 pivot towers separate and located inside the pivot from the RACE cotton variety trials. For the irrigated field, these 16 rows were planted at 70,000 seed per acre. For the established dryland field, these 16 rows were planted at 40,000 seed per acre. The higher seeding rates were used to ensure adequate stand establishment for all treatments. Following conformation of establishment on 7 June, the Plains Pest Management team and Suhas Vyavhare's team hand thinned all plots down to assigned treatment level. Irrigated treatment final plants per acre plots

Trial Map Treatment Description

Trt	Code	Description
1	CHK	40-45,000 PPA
2		30-35,000 PPA
3		20-25,000 PPA
4		15-20,000 PPA

Figure 5. Plants per acre treatments under irrigation.

Trial Map Treatment Description

Trt	Code	Description
1	CHK	30-35,000 PPA
2		20-25,000 PPA
3		15-20,000 PPA
4		10-15,000 PPA

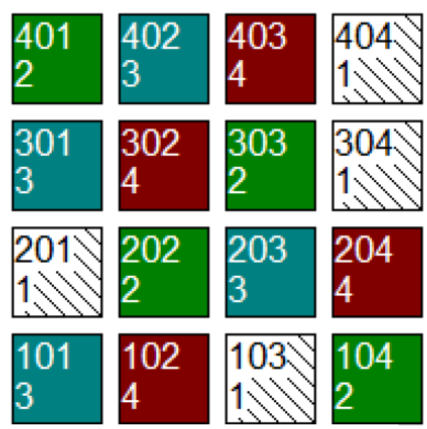


Figure 4. Plants per acre treatments under established dryland.

were thinned to treatments of 40-45,000 PPA, 30-35,000 PPA, 20-25,000 PPA, and 15-20,000 PPA. Established dryland (dryland) treatment plants per acre treatments were thinned to 30-35,000 PPA, 20-25,000 PPA, 15-20,000 PPA, and 10-15,000 PPA.

Every opportunity to compare these final plant stands agronomically and for pest differences were taken. On 14 July, all pertinent agronomic data was collected from the plots. Plant height, first fruiting branch, top 5 internode length, total node count, total fruiting site number, and percent fruit drop were all taken. Also on 14 July, with some level of fleahoppers found in both fields, fleahopper population by plant population data were taken in terms of number of fleahoppers per 13.5 row feet. On 16 September more plant agronomic data were taken on plant height, total nodes, node of top boll, node of uppermost cracked boll, percent open boll and yield estimating boll counts were taken. Harvest was conducted on 5 December via machine harvest, whole plot samples weighed, and grab samples ginned at the Texas A&M Cotton Improvement sample gin in Lubbock where seed weight, lint weight, and percent lint turnout was calculated. All yield data has been adjusted to a per acre basis. All data were compared via ARM, ANOVA, LSD at p=0.05.

Results and Discussion

Objective 1 – assessing the viability of establishing dryland with split use pivot for irrigation sustainability:

On 7 June, all possible seedlings had established for all fields and final stand counts for the full fields were taken. Final stand counts for the irrigated treatment over the full field established at 36,000 plants per acre. The established dryland treatment established stands at 17,500 plants per acre. The dryland portion originally established at 18,500 plants per acre. Over the next several weeks, without additional rainfall, the true dryland field began to desiccate and reduce plant population to below economic levels. On 27 June the true dryland portion of the field was abandoned while the established dryland and irrigated treatments developed normally through the early season.

Agronomically, the irrigated and established dryland were very similar during the pre-squaring developmental stages. Shortly after, the irrigated treatment, while still struggling, developed much better throughout the remainder of the year. No plant growth regulators were needed for either treatment. The true dryland field suffered until permanent wilt occurred.

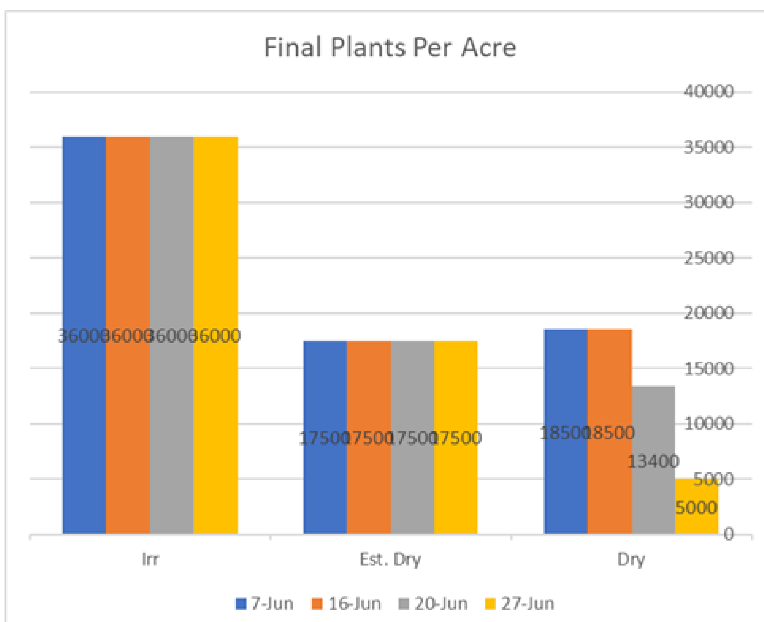


Figure 6. Final PPA for all irrigation treatments.

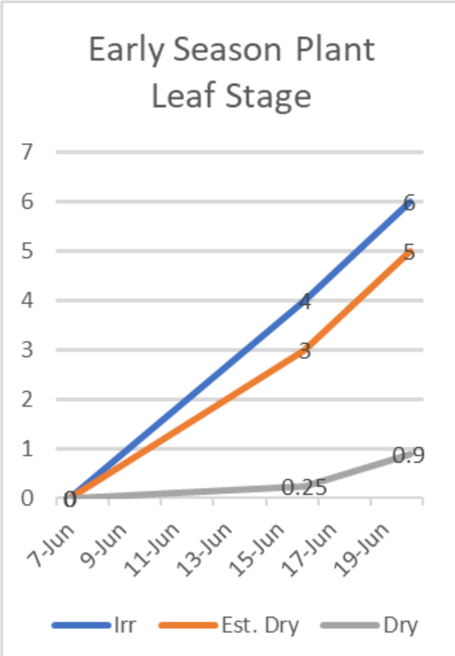


Figure 7. Early season true leaf stage by date over time.

The irrigated treatment developed marginally quicker than the established dryland treatment through the squaring stage with the established dryland receiving just enough moisture to continue development.

Both fields reached 1st bloom during the same week, although at the 20 July scouting date. On this date the irrigated did have 4 to 5X the number of blooms visible in-field while taking a NAWF measurement for the dryland on this date was difficult.

Both field treatments dropped in node above white flower averages rapidly over time corresponding to an early cut-out for both fields.

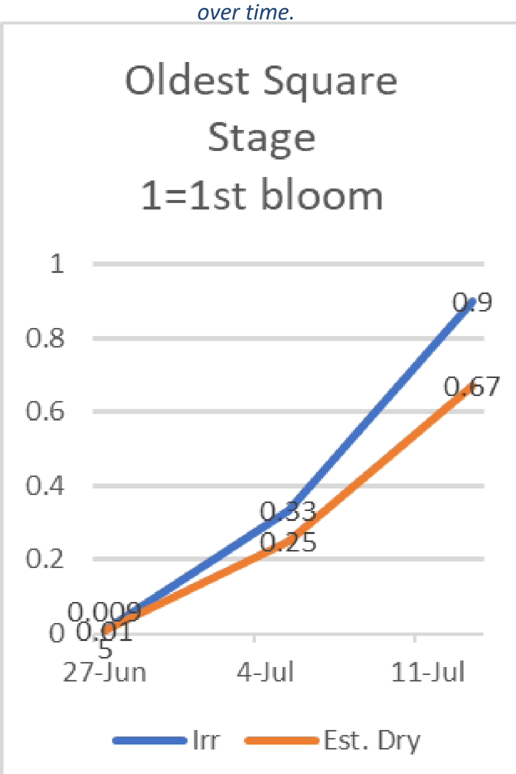


Figure 8. Oldest square stage over time by treatment with 1st bloom = 1.

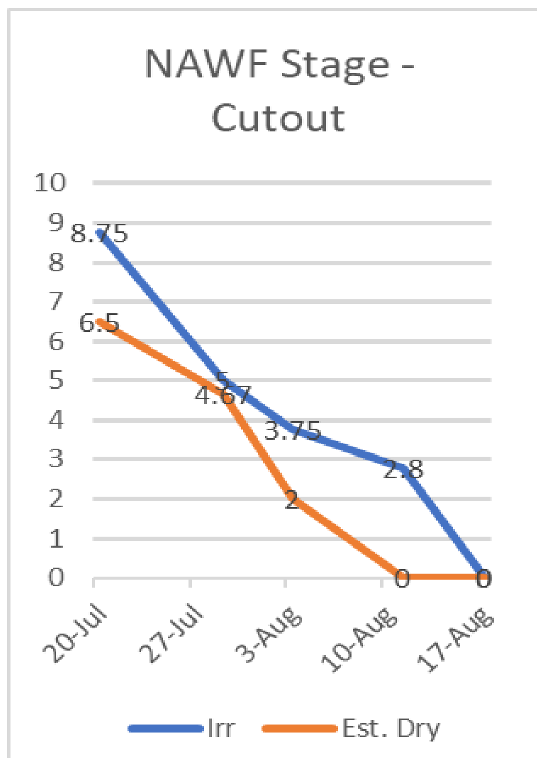


Figure 7. NAWF average by treatment over time.

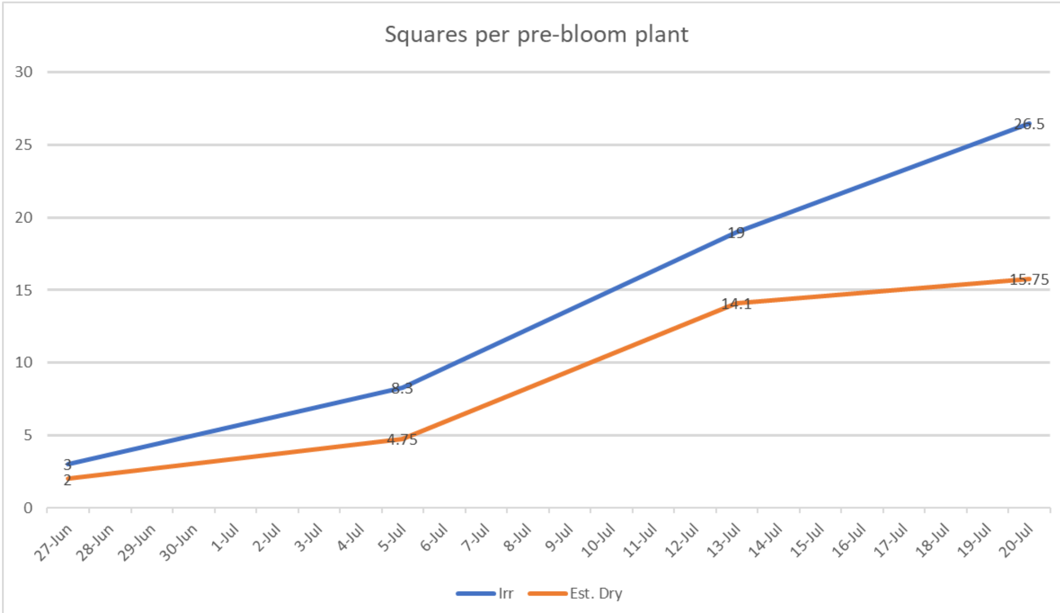


Figure 8. Squares per pre-bloom plant by treatment over time.

The irrigated field, moving into bloom, did experience a slightly higher percent fruit loss due to sub-threshold plant bug pressure. Fruit loss amplified for both fields rapidly once they the critical 5 NAWF stage and peak water use. Plants only held and developed the amount of small bolls concurrent for each treatment. The established dryland rapidly overtook the irrigated field, only holding onto 1 or fewer bolls per plant.

Resulting yields from across the field were also disappointing with the established dryland only yielding 184 lint pounds per acre and the full irrigation yielding 689 lint pounds per acre. While the trial did prove establishing dryland is possible, even in extreme conditions on the High Plains. It should also be noted that if drought conditions persist, it might not be advisable to.

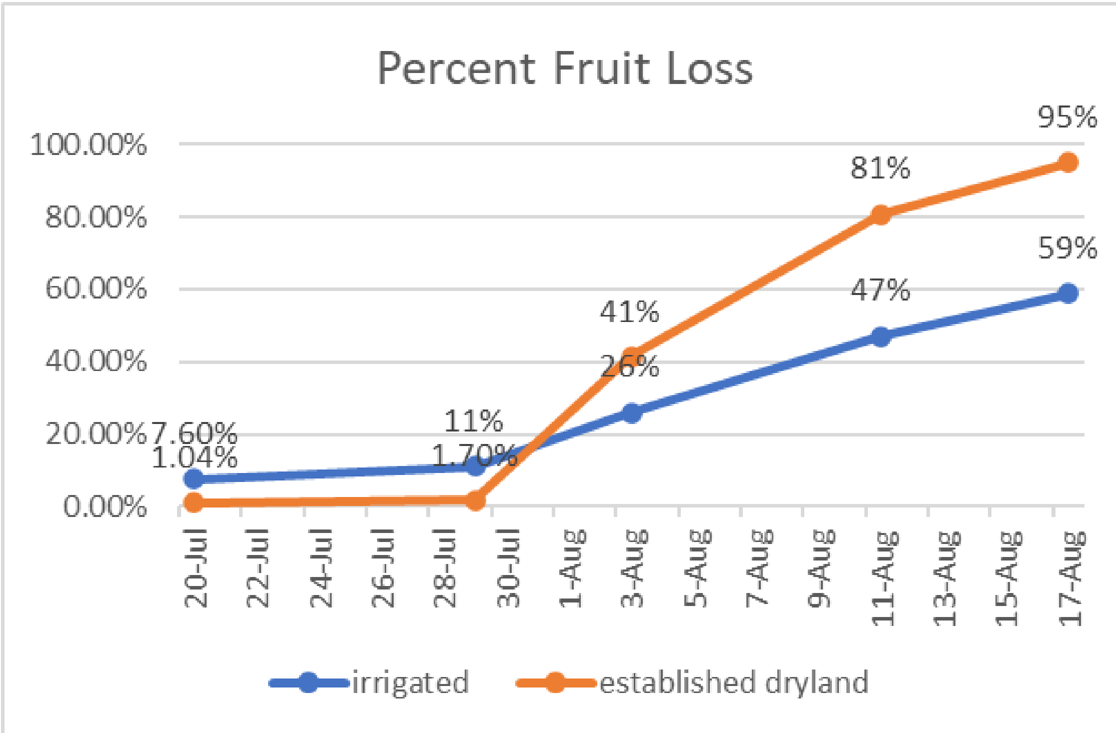


Figure 9. Percent fruit loss while treatments were in the measurable NAWF stages.

Yield in the irrigated treatment averaged 647 pounds lint per acre across the field. Established dryland only yielded 127 pounds lint per acre across the field.

Objective 2 - Evaluate agronomic inputs of established dryland compared to a direct shift to traditional dryland from full irrigation and the impacts on soil health:

First year soil sample data indicated no significance in soil salinity between sampling depths (data not shown) or between irrigation treatments (p = 0.7760, Table 1). Low levels of soluble salts indicate that there are currently non-saline conditions at this field site. Evaluation of other evaluated soil properties indicate that there were no statistical differences between the irrigation treatments. Because the cotton system is in rotation with the sorghum such that the established dryland is never dryland for two consecutive years, it is possible that the producer may not incur significant soil salinization from low levels of irrigation water. Soil aggregate stability, an indicator of soil health, was measured (0-8 inch depth) in both irrigation treatments using the Ward lab modified wet sieve method. There were no significant differences in the 1-2 mm aggregate stability analyses between irrigation treatments (p = 0.4499), and the field average was 9.2 % for the 1-2 mm fraction, which is indicative of poor physical structure. Low aggregate can negatively impact infiltration and root growth as well as make the soil susceptible to erosion.

Table 4. Soil properties by treatment for the irrigated and established dryland.

Depth (in)	Irrigated			Est. Dryland			CV, %	p-value
	0-6	6-12	12-24	0-6	6-12	12-24		
pH	8.1	8.1	8.3	7.8	8	8.2	2.3	0.0628
% Organic Matter	0.4	0.4	0.4	0.5	0.4	0.3	14.6	0.6389
Bulk Density (g/cm3)	1.5	1.7	1.7	1.6	1.6	1.7	6.3	0.9410
Soluble Salts (mmho/cm)	0.4	0.4	0.4	0.5	0.4	0.3	24.6	0.7760
Nitrate-N (ppm)	30.0	39.3	22.7	48.0	31.3	15.7	63.1	0.9716
Potassium (ppm)	328.0	230.3	197.3	420.7	243.3	218.3	32.4	0.3257
Sulfate-S (ppm)	16.4	17.2	16.7	14.6	15.1	17.6	14.7	0.3926
Iron (ppm)	6.6	7.8	7.5	6.1	8.0	7.9	11.8	0.9143

Results from the Swisher County RACE Trials, under both the irrigated treatment and established dryland treatment are in Table 2, 3, and 4.

Table 2. 2022 stand counts for Texas A&M AgriLife irrigated RACE Plots located in Swisher County, Jeremy Reed Cooperator.

	Swisher Irrig.	Swisher Est. Dryland
Planted Seeds/Acre	50,000	24,500
	Plants/acre	
DeltaPine 1820 B3XF	27,770	-----
DeltaPine 1822 XF	39,640	18,186
DeltaPine 1908 B3XF	32,343	-----
DeltaPine 1909 XF	-----	16,117
DeltaPine 2012 B3XF	-----	16,226
DeltaPine 2115 B3XF	25,592	-----
DeltaPine 2123 B3XF	-----	13,939
DeltaPine 2127 B3XF	27,334	-----
NexGen 3195 B3XF	30,710	12,959
NexGen 3299 B3XF	17,860	8,930
Stoneville 4993 B3XF	28,641	11,217
Trial Average	**28,736**	**13,939**
CV, %	9.7	14.4
p-value	<0.0001	0.0007
LSD	4,809	3,546

Table 3. 2022 Lint yield, quality, and loan value results for the Texas A&M AgriLife irrigated RACE Plots located in Swisher County, Jeremy Reed Cooperator.

Variety	Seed Cotton Yield --- lb/acre ---	Turnout --%--	Lint Yield --- lb/acre ---	Seed Yield --- lb/acre ---	Micro-naire	Fiber Length (in.)	Strength (g/tex)	Uniformity --%--	Lint loan Value cents/lb	Lint Value --- $/acre ---
NG 3299 B3XF	2168	35	764	1079	4.9	1.16	30.2	83	54.9	596
DP 1908 B3XF	2357	31	739	1043	4.7	1.23	30.9	83	55.5	578
DP 2127 B3XF	2054	35	723	1021	5.1	1.17	28.3	83	55.1	561
DP 2115 B3XF	2050	34	704	994	4.8	1.20	28.9	83	56.5	561
ST 4993 B3XF	1836	37	673	950	5.3	1.12	30.2	83	53.1	504
NG 3195 B3XF	1956	34	672	949	4.6	1.18	29.7	83	56.0	532
DP1822 B3XF	2058	31	645	911	4.7	1.24	32.0	82	56.2	512
DP 1820 B3XF	1921	32	605	855	4.9	1.24	31.9	84	56.2	480
Test Average	**2050**	**34**	**691**	**975**	**4.9**	**1.19**	**30.3**	**83**	**55.4**	**541**
CV, %	15.1	7.0	18.3	18.3	4.1	2.8	3.4	0.8	2.8	19.1
p-value	0.5998	0.0886	0.8169	0.8169	0.0171	0.0044	0.0037	0.3525	0.2359	0.8560
LSD	NS	NS	NS	NS	0.3	0.06	1.8	NS	NS	NS

Value for lint based on CCC loan value from grab samples and FBRI HVI results.
Lint loan value calculated from the 2022 Upland Cotton Loan Evaluation Model from Cotton Incorporated using a $0.52/pound base.
Samples ginned on a Compass gin at TTU-FBRI.
Seed value calculated using 1.41 lbs seed/lb lint.

Table 4. 2022 Lint yield, quality, and loan value results for the Texas A&M AgriLife established RACE Plots located in Swisher County, Jeremy Reed Cooperator.

Variety	Seed Cotton Yield --- lb/acre ---	Turnout --%--	Lint Yield --- lb/acre ---	Seed Yield --- lb/acre ---	Micro-naire	Fiber Length (in.)	Strength (g/tex)	Uniformity --%--	Lint loan Value cents/lb	Lint Value --- $/acre ---
NG 3299 B3XF	903	31	282	398	4.3	1.22	32.4	83	55.7	157
ST 4993 B3XF	773	32	251	354	4.3	1.21	31.3	83	57.0	143
DP 1820 XF	856	29	249	352	4.5	1.24	30.7	82	55.0	137
NG 3195 B3XF	762	30	227	320	4.2	1.22	29.2	82	56.4	128
DP 2123 B3XF	765	29	221	313	4.7	1.17	29.4	80	52.6	116
DP 2012 B3XF	873	25	218	308	4.4	1.29	31.5	82	56.6	123
DP 1822 XF	686	29	196	277	4.5	1.25	32.4	81	55.2	108
DP 1909 XF	668	29	191	269	4.3	1.22	29.7	81	54.9	105
Test Average	**786**	**29**	**229**	**324**	**4.4**	**1.23**	**30.8**	**82**	**55.4**	**127**

Value for lint based on CCC loan value from grab samples and FBRI HVI results.
Lint loan value calculated from the 2022 Upland Cotton Loan Evaluation Model from Cotton Incorporated using a $0.52/pound base.
Samples ginned on a Compass gin at TTU-FBRI.
Seed value calculated using 1.41 lbs seed/lb lint.

Objective 3 - Evaluate insect pest populations and re-evaluate pest thresholds for best IPM practices and sustainability under all irrigation treatments.

During the early season, thrips per true leaf counts were very similar with the irrigated treatment being slightly higher. With a early influx of more adult thrips, and field history, it was determined that both fields should be over sprayed with insecticide to maintain thrips control above what the seed treatments were offering. Reed Farms, in a mix treatment with the first over-the-top herbicide treatment of Roundup and Dual for both farms, added acephate at 3.2 oz. per acre to both treatments. The timing of this treatment on 10 June equated to the 4th true leaf stage for the irrigated field and 3rd true leaf stage for the established dryland. After the OVT treatment, thrips numbers remained low for both fields.

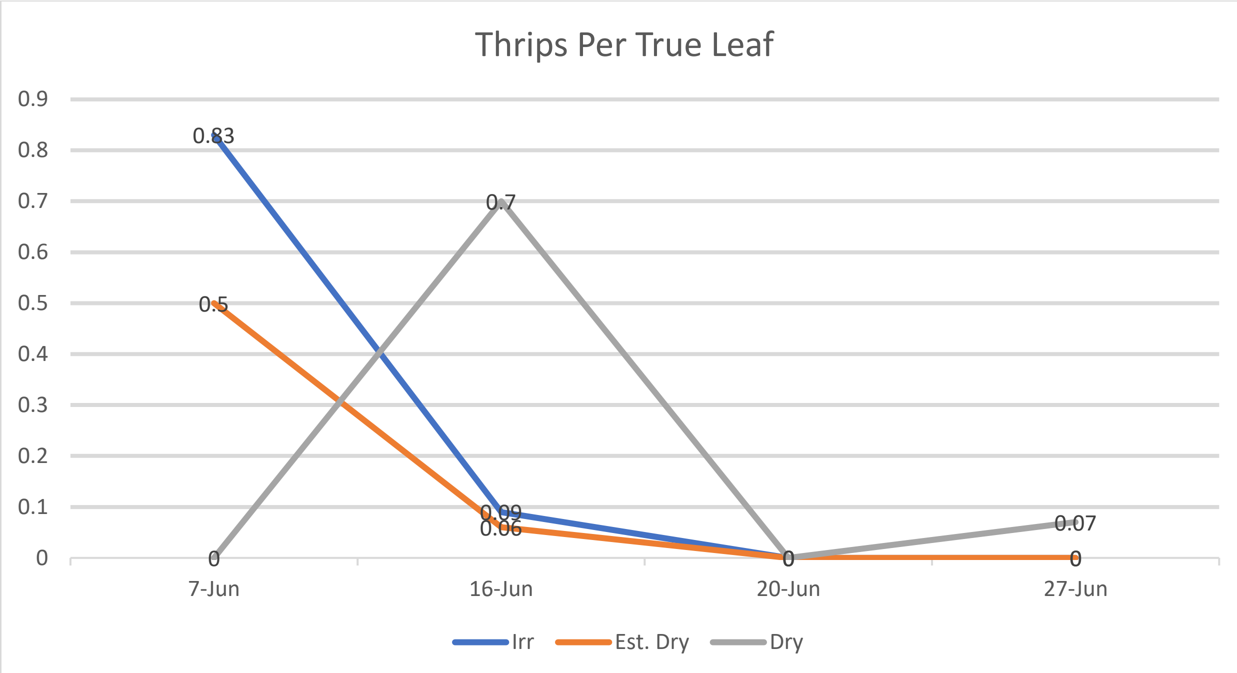


Figure 10. Thrips per true leaf by treatment over time. OVT treatment was made on 10 June.

During early plant and square development, insects still seemed attracted to both fields, but more so for the irrigated treatment. All pests were well below established economic levels with fleahoppers populations the most noteworthy species. The infestation pattern looked similar for both treatments but was higher in the irrigated for all at fleahopper risk check dates. It does appear that fewer fleahoppers went into or settled in the established dryland with lower numbers moving into the field during movement patterns and an undetectable number settling there.

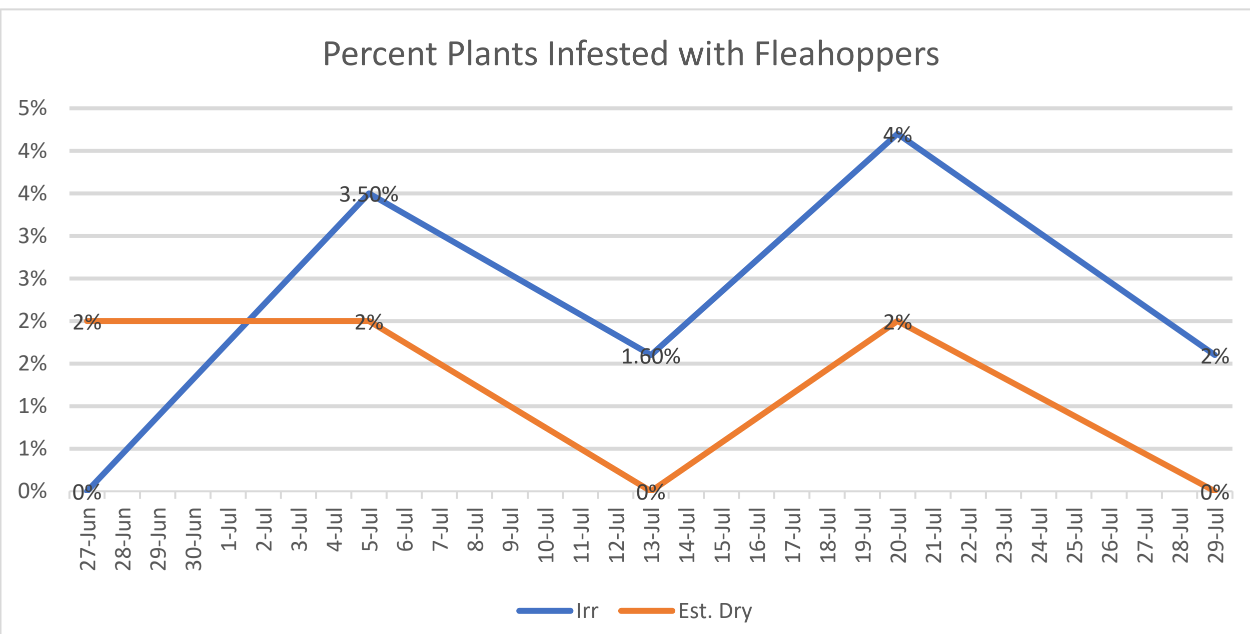


Figure 11. Percent plant terminals infested with fleahoppers during at-risk pre-bloom squaring over time.

A very light Lygus population, usually consisting of 1 Lygus per 22.5 row-feet or less weekly, could be found weekly in the irrigated treatment from 1st bloom through to cut-out but none were found in the established dryland treatment. There were also 2 weeks where very light bollworm eggs were found in the irrigated treatment only, but no detectable worms resulted. A reduction of insects in general for both treatments when compared to a 'normal' season from 1st bloom on was recorded. Still the beneficial population could be considered moderate for the pest pressure available and active in reducing pest numbers in both fields until absolute cut-out stage.

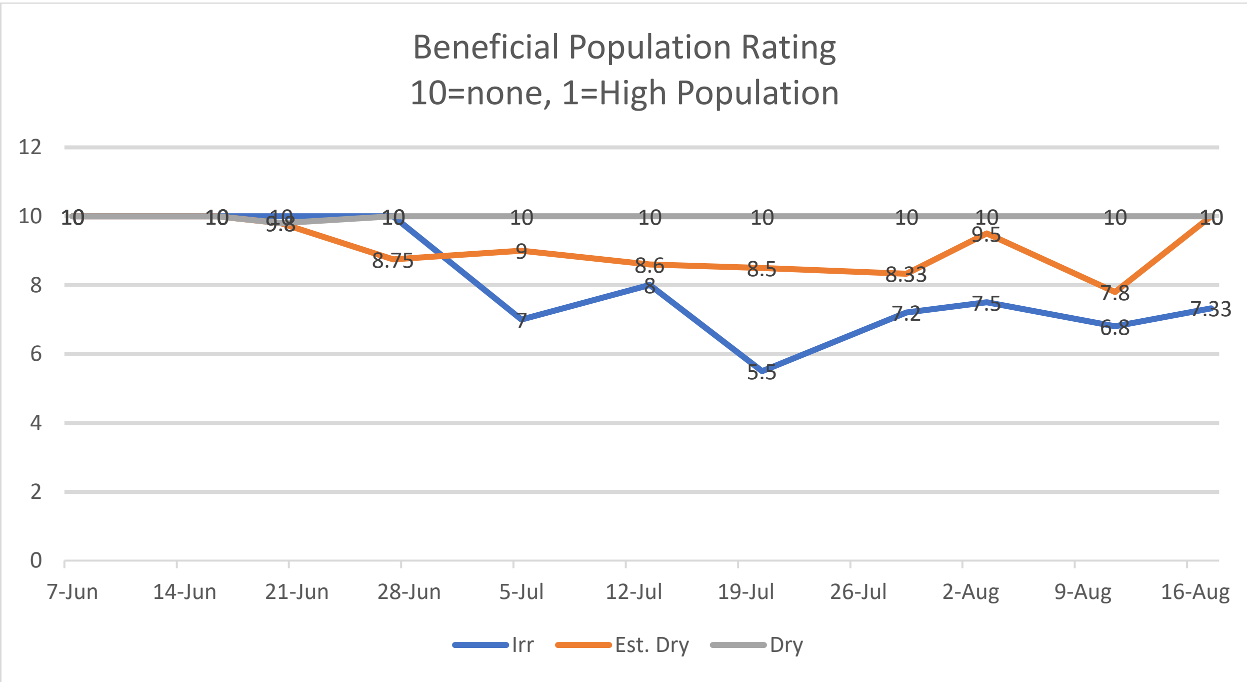


Figure 12. Beneficial population ratings by treatment over time for the duration of the season.

A variable stink bug population (peak at 1 stink bug per 27 row feet) did warrant continued and detail scouting for the irrigated treatment through September when none were ever noted in the established dryland treatment.

Objective 4 – Help identify potential best management references for shifting irrigated acres to established dryland production through small plot trials within larger irrigation treatments.

The 14 July fleahopper population by plant density data yielded no significant fleahopper differences between plant population treatments. In the irrigated trial, all treatments held 0.2 to 0.3 fleahoppers per 13.5 row feet (*P*=0.9742, LSD=0.99). In the established dryland trial, only 1 fleahopper was found in any plot for the entire test, which was the 20-25,000 plants per acre treatment. This resulted in unbalanced data that could not be statistically compared.

For the irrigated trial, no 14 July agronomic data held significant differences and no major numeric trend was noted. The only significant difference in the 16 September agronomic data were found in the number of total fruiting nodes per plant.

Table 5. Total Nodes per plant by plants per acre treatment in the irrigated field. (*P*=0.0286, LSD=1.28)

Plants per Acre	**Total Nodes per Plant**
40-45,000	19.8b
30-35,000	21.3a
20-25,000	21.1ab
15-20,000	21.9a

In the established dryland trial, no 14 July agronomic data was significant. Again the only agronomic data of significance was the 16 September total nodes per plant data. It should be noted that this overall plant height data was recorded almost a month behind the late August and early September rainfall events of 4.29 inches that was of no benefit to the crop but did represent considerable plant regrowth.

Table 6. Total Nodes per plant by plants per acre treatment in the established dryland field. (*P*=0.0200, LSD=1.16)

Plants per Acre	**Total Nodes per Plant**
30-35,000	19.8b
20-25,000	19.3b
15-20,000	20.3ab
10-15,000	21.3a

No significant differences were found in any of the yield data for the irrigated plants per acre trial. An interesting numeric trend was found in all per acre yield data points, most importantly in lint yield per acre.

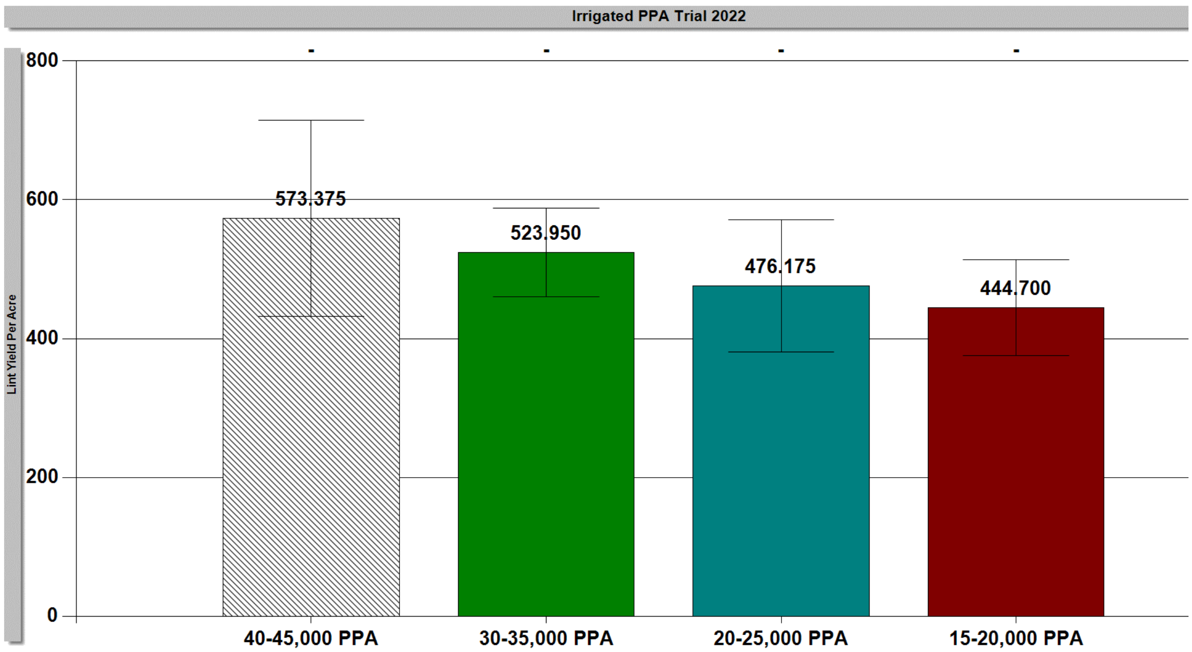


Figure 13. Irrigated lint yield per acre (P=0.5434).

The established dryland yield data also shown no significant differences. The numeric trend noted here does hint that the lower plant two plant populations might increase with lower populations. Please note the extreme low lint yields of the plots.

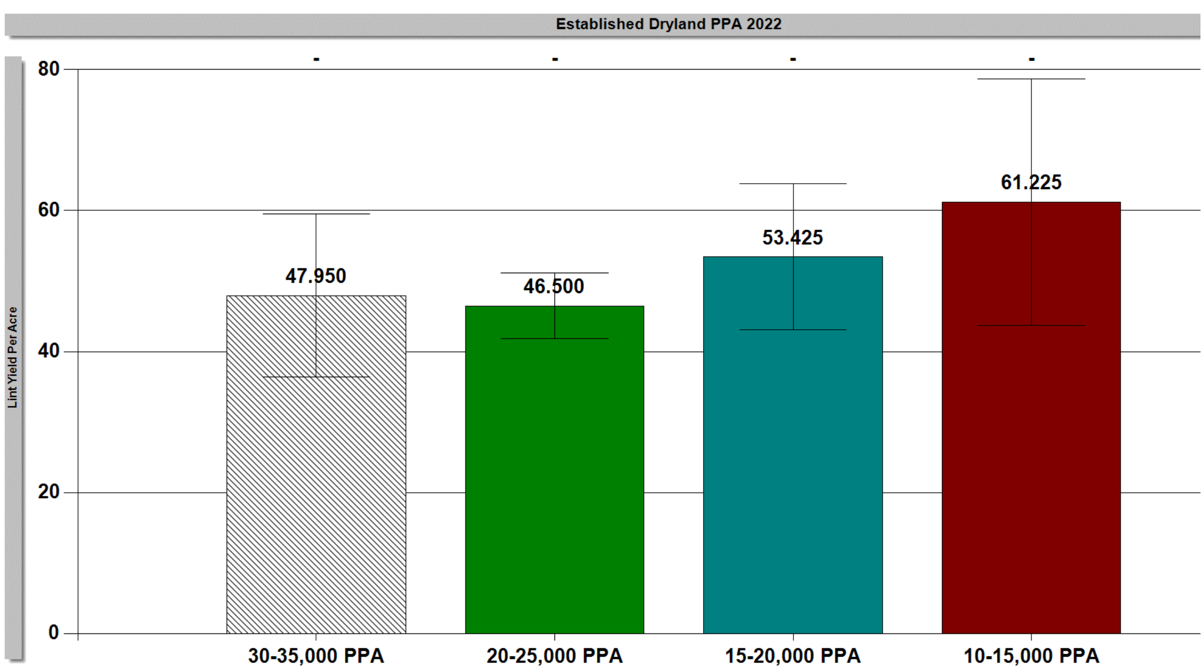


Figure 14. Established dryland yield per acre by PPA treatment (P=0.7815).

Conclusions

Objective 1 – assessing the viability of establishing dryland with split use pivot for irrigation sustainability:

The established dryland, with an additional 3-inches of moisture added pre-plant and pre-emergence and planted at the same 24,500 seed per acre as the dryland treatment, successfully established at 17,500 plants per acre for the whole field. The dryland eventually desiccated with the moisture available. This provides some proof of concept for one hypothesis of objective 1. Where applicable, investing limited irrigation early can more reliably establish intended dryland fields on the Texas High Plains. The extreme drought situation through the spring 2022 and the lack of spring moisture is not uncommon on the Texas High Plains. This practice, if implemented, has the potential to improve dryland establishment rates far above the standard High Plains normal of 4 out of 10 years. During most of the Texas High Plains summer growing seasons, an increase in useable crop moisture naturally occurs over the growing season, even if natural planting moisture is short. For this reason, establishing dryland could prove very sustainable over time.

The true sustainability of the practice is reliant upon an eventual increase in natural moisture at some point during the growing season the established plants can make use of. The successful establishment of dryland fields by this practice on the High Plains seems to be a moot point without adequate additional moisture for the balance of the effective growing season. This availability of later season moisture did not happen during the 2022 season. This too is not unprecedented on the Texas High Plains and heavily impacted yields were a result. This is why the supposed harvest rate of established dryland on the Texas High Plains would not increase to 100%. These results hint that an increase from the standard 4 out of 10 years to a 7 or 8 out of 10 years would be more reliable.

Given the extreme drought conditions of 2022 and resulting low yields from the established dryland field, combined with increasing input costs, indicate these plots would not have been economical to harvest. The resulting yield data were taken for scientific reasons, not economic.

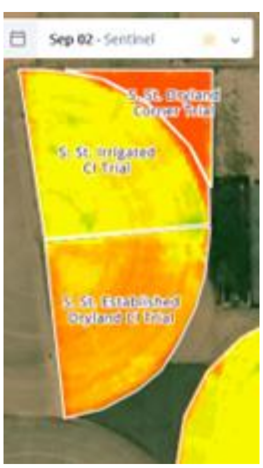


Figure 15. September CropWise image of fields.

The irrigated treatment was not immune to the extreme drought situation of 2022. As farther proof of hypothesis of objective 1, Reed Farms was able to focus 10.25 inches irrigation onto the concentrated acre irrigated area rather than splitting the more likely 5 to 6 in-season irrigation inches across the full half pivot as per standard practice. This focusing did yield a more field sustainable result than the standard practice would have under the same circumstances, but did not yield an economically sustainable result. The focused 10.25 irrigated inches combined with the 0.87 crop usable natural rainfall moisture that fell during the active plant growing season was not enough to reach yield goals while input costs far outweigh returns.

Reed Farms were also unable to follow ideal recommended irrigation scheduling due to the dire situation of the drought conditions. Ideally, the July time frame for squaring-early bloom should have received only 2-inches and the later season and boll set period of August 1-15 should have received 4.25-inches during this peak water use timeframe. However, the desperate condition of the July window and crop condition necessitated running the pivot non-stop to maintain field viability. Once August and peak water use arrived, irrigation capacity then could not be increased to meet recommendations. This resulted in more vegetative growth in July and more natural/water-stressed fruit drop during peak bloom.

While this first year of the trial did prove establishing dryland is possible, even in extreme conditions on the High Plains, and it does allow for a better focusing of irrigation water during the growing season. This combination should, on average, should make for a more sustainable and water conserving practice. It should also be noted that if the extreme drought conditions persist, it might not be advisable to raise a summer crop in need of supplemental moisture. Hopefully additional research years, combined with this one, will provide a more predictable average recommendation about the establishing dryland concept for any given year.

Objective 2 - Evaluate agronomic inputs of established dryland compared to a direct shift to traditional dryland from full irrigation and the impacts on soil health:

Varietal results from both the Swisher County RACE Trials can be found in tables 2, 3, and 4. These should be standalone tabled results useful to help producers in varietal decisions by situational environment and will not be commented on here as varieties change year by year.

Soil salinity is of interest at this field site because of the deficit irrigation and the concern about salts accumulating at a greater rate in the established dryland system. This season's soil samples will be viewed as a base line for the rotating established dryland system. As the treatments rotate around the pivot in future seasons, changes will be noted. Low levels of soluble salts from this year's samples indicate that there are currently non-saline conditions at this field site. Evaluation of other evaluated soil properties indicate that there were no statistical differences between the irrigation treatments yet. Because the cotton system is in rotation with the sorghum such that the established dryland is never dryland for two consecutive years, it is possible that the producer may not incur significant soil salinization from low levels of irrigation water.

Objective 3 - Evaluate insect pest populations and re-evaluate pest thresholds for best IPM practices and sustainability under all irrigation treatments.

The economic threshold for any pest is defined as the density of a pest population that will justify treatment. It remains the most important parameter in pest-management decision making. All know thresholds have been researched extensively to determine what damage any given pest density will cause to any given crop and calculated against the cost of control measures to determine action levels.

Currently, there are no differences in economic thresholds for irrigated and dryland crops in Texas. On the Texas High Plains, dryland crops are managed drastically different than irrigated. While thresholds for both dryland and irrigated remain the same, due to the moisture availability differences, they are not managed for pests the same over the full season unless natural moisture is abundant for the full season. At some point during the growing season, the insect's will become less attracted to dryland fields. As this happens, scouting can become less detailed in dryland fields. Efforts in this objective are 1) to better understand if pest thresholds for dryland or established dryland need to be adjusted for a lighter yield potential and likely lighter pest populations, 2) better understand when dryland fields do not require intense scouting, and 3) understand if establishing dryland significantly alters pest population habits from traditional dryland.

Data from 2023 did 1) not offer any data that indicates one way or another that thresholds should be adjusted, 2) shown that the timing of reducing scouting intensity is legitimate but likely dependent upon seasonal moisture available, and 3) demonstrated that shortly following stand establishment, early season pests populations in established dryland were more like irrigated but shortly afterward followed the typical dryland pattern for diminishing pest pressure much like traditional dryland.

Objective 4 – Help identify potential best management references for shifting irrigated acres to established dryland production through small plot trials within larger irrigation treatments.

Yields from the irrigated plant per acre trial indicated that higher plant populations resulted in higher yields. This agrees with previous plant per acre trials. The 2022 data, under the extreme drought, did not find a minimum plant population for the field's yield goal of 1,200 lint pounds. No treatment yielded anywhere near the field's yield goal. Instead, plants did not receive adequate moisture inputs to reach their maximum genetic potential. Thus, more plants equated to more yield without competition between plants. Previous plant per acre research indicates that a population of 60,000 or more would equate to a yield limiting competition between plants, but a minimum of 27,000 are needed for 1,200 pound lint yield and 31,000 minimum is needed for 1,500 pound plus yields. The data presented here did not confirm nor deny the previous results as plants did not receive adequate moisture to achieve those yields.

Yields from the established dryland primarily indicated that if drought conditions extend into the growing season, it is not economically feasible to continue production. In attempting to interpret the data available, yield differences were not statistically significant, but did indicate that plant competition did occur between the 30-35,000 plant stands and the 20-25,000 plant stands for the moisture available. It also hinted that a population of 10-15,000 would fit this type of moisture environment best. This does not disagree with the previous plant per acre studies as 13,000 is traditionally viewed as minimum to make dryland yield goals of 425 lint pounds per acre. However, the previous studies indicated that a minimum population of 24,000 is needed to make higher yields of 700 plus pounds per acre opportunistically.

The 2022 data should be viewed as a near worst case scenario for the High Plains and should be averaged with future results from this trial.

Acknowledgements

This work is primarily supported by a Cotton Incorporated, Texas Support Grant Project 22-522TX. All Unit work is supported by Crops Protection and Pest Management Competitive Grants Program from the USDA National Institute of Food and Agriculture. I would like to extend thanks to Jeremy Reed and the whole crew at Reed Farms for cooperating with us to gather this data and the 2022 Plains Pest Management Field Scouts and Lab Technicians for data collection and labor associated with this trial: Brenden Adams and Denise Reed. An extra thanks goes to Dr. Pat Porter and John Thobe for assistance in harvest equipment repair and harvest data collection. Thank you all.

2022 Population Monitoring of Adult Bollworms in Hale & Swisher County

Texas A&M AgriLife Extension Service
Hale & Swisher County
Cooperators: Mike Goss, Shane Berry
Blayne Reed EA-IPM Hale & Swisher and Dr. David Kerns

Summary

The data generated from this effort indicated that the 2022 bollworm population in both counties was far below what an average season's pressure would be but is much like the most recent 3 seasons of 2019, 2020, and 2021 seasons were. This marks 4 consecutive seasons of light bollworm pressure. It was suspected that a lack of migratory worms to the region was due to weather patterns and possibly better management of the bollworms by producers in other crops and possibly other regions. Our field data generated by the Plains Pest Management scouting program confirmed this light population for 2019, 2020, 2021, and 2022 with a nearly complete lack of economic problems caused by the bollworm during the growing season.

Adult Lepidopteron pest monitoring is not a guarantee of pest presence or economic problem predictability. Trends can be noted and timely alerts for potential egg lay and volume of the area bollworm pest populations can be extrapolated. Assumptions based upon known pest biology combined with this effort can infer aspects about general adult bollworm movement, immigration, and emergence. In an effort to help monitor for this major pest of multiple crops, the information generated from this effort was shared with district and regional researchers, crop consultants, agribusiness professionals, and area producers through the Plains Pest Management Newsletter, the High Plains 'Radio' Podcast, discussions on radio programs, and freely shared independently as requested. If compiled with similar efforts completed in the past, historical trends for the bollworm might be

established. Two trapping sites were utilized, one for each county served. The Swisher trap was in central Swisher along the Middle Tule Draw and the Hale trap was in southwestern Hale near Cotton Center. Traps were counted weekly and species-specific pheromone lures changed bi-weekly.

Objective

This effort was made to monitor the adult bollworm (corn earworm, sorghum headworm) population trends throughout the summer growing season in Hale & Swisher County both for immediate and historical use.

Materials and Methods

Standard wire-framed Lepidopteran cone traps and *Helicoverpa zea* specific pheromone lures were utilized in this effort. Traps were suspended upon rebar posts at a height of roughly 4 ½ feet to the top of the trap. Traps were checked, moths counted, recorded, and traps emptied weekly, and pheromone was changed bi-weekly.

Figure 9. Standard moth trap used in monitoring.

Two trapping sites were utilized, one for each county served. The Swisher trap was in central Swisher along the Middle Tule Draw on the Mike Goss Farm (34 26 29.65N -101 44 27.33W) to capture overwintering moths and moths migrating from the east up the Caprock escarpment. The Hale trap was in southwestern Hale near Cotton Center on the Shane Berry Farm (33 59 43.59N -101 58 31.39W) to capture overwintering moths and immigrant moths moving from the south. Traps were counted weekly and species-specific pheromone lures changed bi-weekly. All traps were set during the first week of June centering on 3 June and concluded the first week of October centering on 7 October.

Results and Discussion

The population for both two counties started lighter than an average year and remained low for the fourth consecutive year. There were no peaks in population and at no time were worms an economic concern in West Texas during 2022.

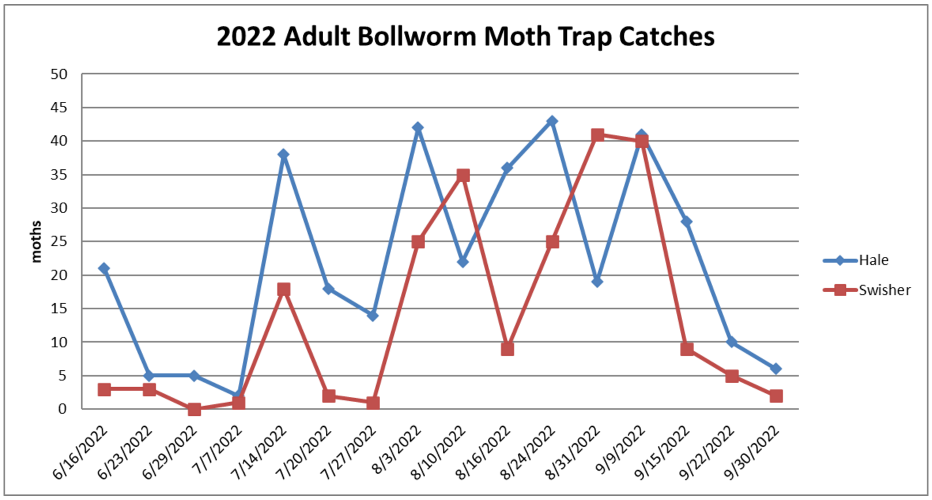


Figure 10. 2022 Adult bollworm weekly catches over time.

The 2022 season marks the lowest bollworm population catches perhaps ever, but certainly for the last 10 seasons.

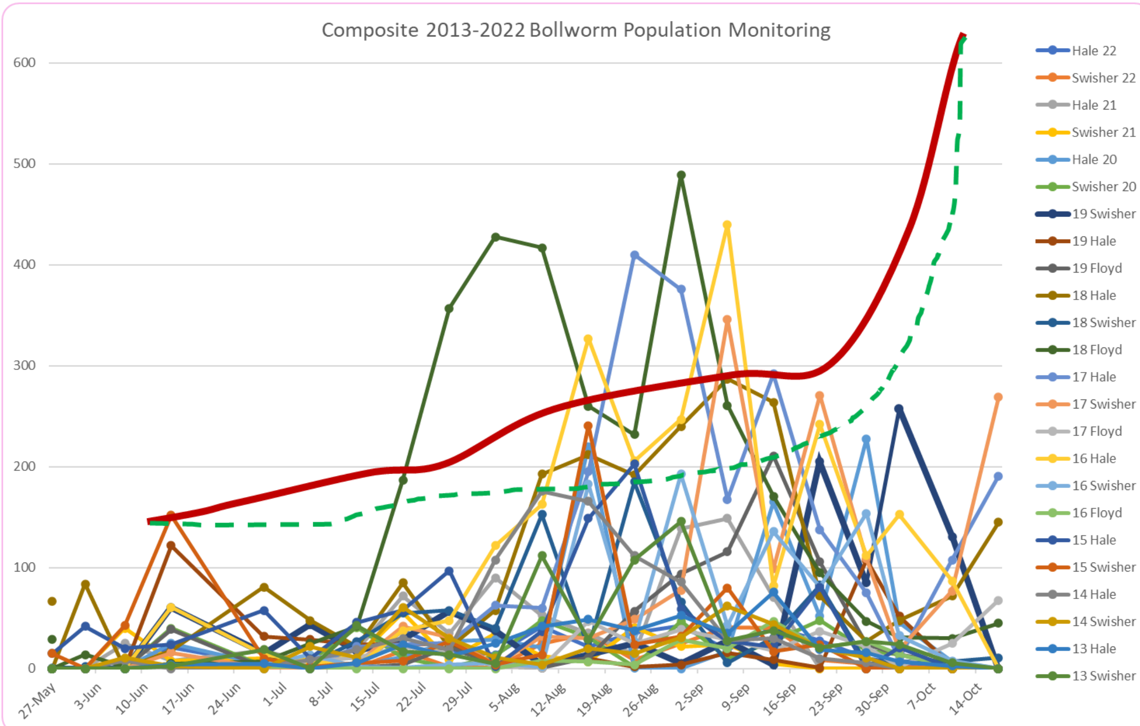


Figure 11. 2013-2022 adult bollworm weekly catches with red lines showing economic damage expectancy level and green lines showing cause for concern levels.

Conclusions

For the fourth straight season, the bollworm population was well below an average or economic concern for the region. An average bollworm population for the Texas High Plains should yield about 450 moths per week during July and August. This historically includes healthy migratory populations of bollworms moving into the area from other crop producing areas to the south and east. The 2022 peak moth capture was only 43 for one week with no major populations found in any week. This lower population trend likely represents the 'native' or successfully overwintered population of bollworms from the previous season only with very few traditionally present migratory bollworm populations moving into the region.

The majority of the Cotton Belt over the past few seasons have dealt with economic populations of Bt and Pyrethroid resistant bollworms very effectively, likely limiting the number of bollworms migrating to the Texas High Plains. The ongoing drought covering much of the Cotton Belt during the 2022 season could have also added to the great reduction of the bollworm population across the State. It is not known if this trend of light populations will continue for the region or the Cotton Belt. If bollworms return to the High Plains in at least average numbers or higher, it is very likely they will be very hard to control through locally preferred means.

Acknowledgements

This work is supported by Crops Protection and Pest Management Competitive Grants Program [grant no. 2017-70006-27188 /project accession no. 1013905] from the USDA National Institute of Food and Agriculture. I would like to extend thanks to our cooperating producers Mike Goss and Shane Berry for working with us to gather this data. I would like to thank the 2020 Plains Pest Management Interns for data collection and labor associated with this work: Brenden Adams and Denise Reed. Thank you all.

2022 Bollworm, *Helicoverpa zea*, - Pyrethroid Resistance Survey in Hale & Swisher County

Texas A&M AgriLife Extension Service / Cotton Incorporated
Hale & Swisher County
Cooperators: Mike Goss and Shane Berry
Blayne Reed, EA-IPM Hale & Swisher and Dr. David Kerns, State IPM Coordinator

Summary

This study is one location of several *Helicoverpa zea* pyrethroid resistance study sites across Texas sponsored by Cotton Incorporated. Traps from the 2022 Hale & Swisher bollworm adult population study were utilized in catching live male moths for this study. Two trapping sites were utilized, one for each county served. Moth exposure vials utilized were 20 mL Scintillation Vials for the product exposure or moth survival test. All moth testing vials were prepared by Dr. David Kern's lab in College Station in groups of 99. All test vials were pre-treated with one of three treatment levels, an untreated check, 5 ug cypermethrin, or 10 ug cypermethrin. All vials were color coded according to treatment levels for ease of trial procedural routine. Due to a light bollworm population during the 2022 growing season, only one check date yielded any moths for an evaluation.

The moth population that survived 24-hour vial-treatment exposure was adjusted using Abbotts Formula to adjust for the health of the moth population and calculate true resistance and dominant resistance levels.

These results indicate that we should only expect at best about **71% control from any pyrethroid** application to this population of bollworms on the Texas High Plains. They also show that 29% of the bollworm population present in 2022 will pass dominant resistance genetic traits on to the next generation of bollworms. In conclusion, a pyrethroid should not be considered the best option for

a first choice economically triggered bollworm treatment on the Texas High Plains in 2022 or the near future.

Objective

Evaluate the level of pyrethroid resistance present within a typical bollworm population prevailing in Hale, & Swisher as a portion of a larger, State-wide survey to reassess the value and level of control offered by this class of insecticides in pest control.

Materials and Methods

This study is one location of several *Helicoverpa zea* pyrethroid resistance study sites across Texas sponsored by Cotton Incorporated. Traps from the 2022 Hale & Swisher bollworm adult population study were utilized in catching live male moths for this study. The traps were standard wire-framed Lepidopteran cone traps and *Helicoverpa zea* specific pheromone lures were utilized in this effort. Traps were suspended upon rebar posts at a height of roughly 4 ½ feet to the top of the trap. Traps were checked, moths counted, recorded, traps emptied weekly, and pheromone was changed bi-weekly.

Figure 12. Example of adult bollworm moth trap used.

Two trapping sites were utilized, one for each county served. The Swisher trap was in central Swisher along the Middle Tule Draw on the Mike Goss Farm (34 26 29.65N -101 44 27.33W) to capture overwintering moths and moths migrating from the east up the Caprock escarpment. The Hale trap was in southwestern Hale near Cotton Center on the Shane Berry Farm (33 59 43.59N -101 58 31.39W) to capture overwintering moths and immigrant moths moving from the south. Traps were counted weekly and species-specific pheromone lures changed bi-weekly. No kill strips were used to maintain optimum moth health.

Due to a light bollworm population during the 2022 growing season, only 1 date yielded enough moths to test. On 12 August 30 moths were collected from Hale County and 7 were collected from Swisher.

Moth exposure vials utilized were 20 mL Scintillation Vials for the product exposure or moth survival test. All moth testing vials were prepared by Dr. David Kern's lab in College Station in groups of 99 and shipped across the State to cooperating agents and specialists including this site. This location received 2 groups of treated vials for the completion of this survey, but only 28 vials were used. All test vials were pre-treated with one of three levels of cypermethrin, an untreated check, 5 ug cypermethrin, or 10 ug cypermethrin. All vials were color coded according to treatment levels for ease of trial procedural routine. Untreated vials remained clear, 5 ug vials were tainted white across the bottom of the vial and 10 ug vials were tainted red across the bottom. Untreated vials were used to test the overall health of the moth population while the 5 ug rate represented a maximum field rate of cypermethrin and survivors would represent a resistant population that would survive a labeled field treatment. The 10 ug rate would represent a 2X rate of cypermethrin and survivors should represent a dominant resistant trait within the moth population. All vials following moth transfer were left slightly loose to ensure air transfer for the moths.

The moth population that survived 24-hour vial-treatment exposure was adjusted using Abbotts Formula to adjust for the health of the moth population and calculate true resistance and dominant resistance levels.

Results and Discussion

The survivorship for both counties were very similar in to the 3 most recent sample years. The overall health of the tested bollworm population was poor with an average UTC survivorship of 53.9% moths surviving 24-hours in untreated vials. The percentage of bollworms surviving the 5-µg treatment, with the Abbott's Adjustment for population health, for both counties become 29%. The number of bollworms surviving the 10 µg and thus likely to pass the resistant trait to the next generation was identical to the 5-µg treatment at 29% for both counties.

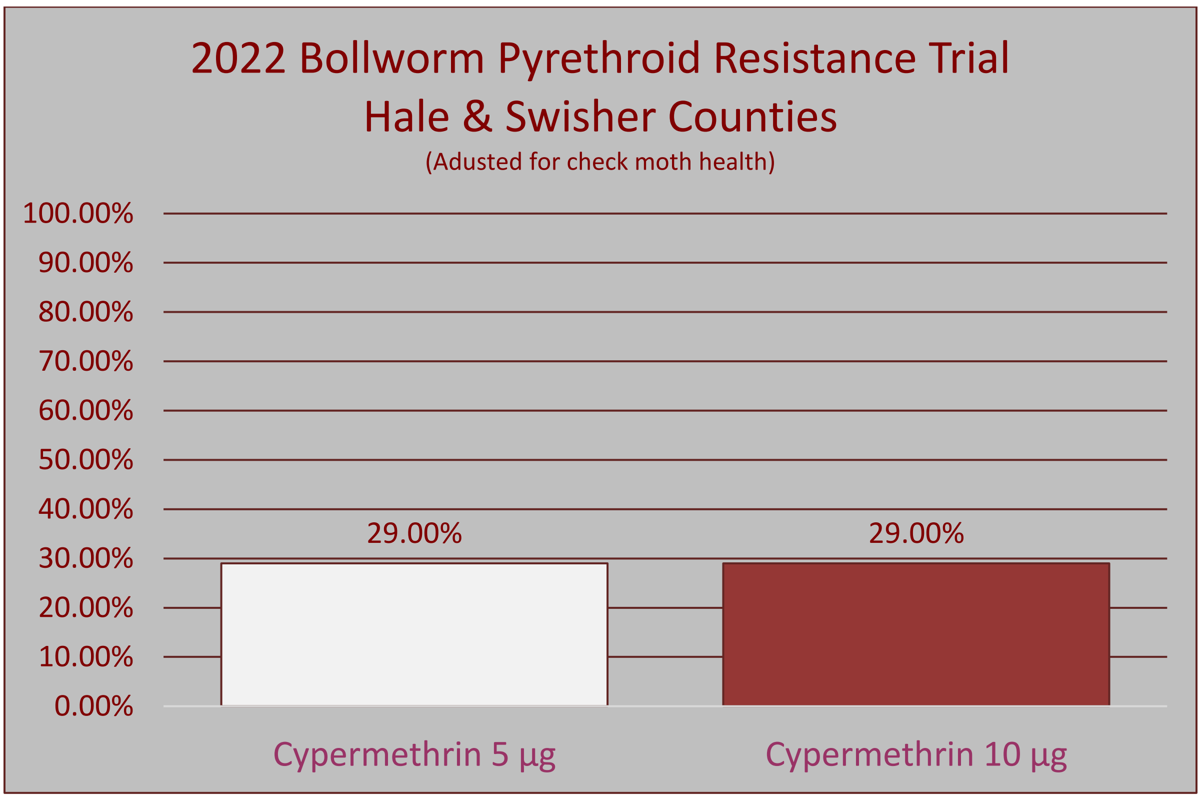


Figure 13. Adult bollworm survivorship by treatment following Abbot's Adjustment calculations.

The 2022 percent bollworm moth 5 µg survivorship data show a slight increase in resistance from 2021 (25%) but remains similar to that year and 2018 (26%). This is still a decrease from 2020 (42.1%) and 2019 (50%). While the 10-µg increased from 2021 (13%) and 2020 (7.68%) it remains much lower than the 2019 (40%) level but similar to 2018 (22%).

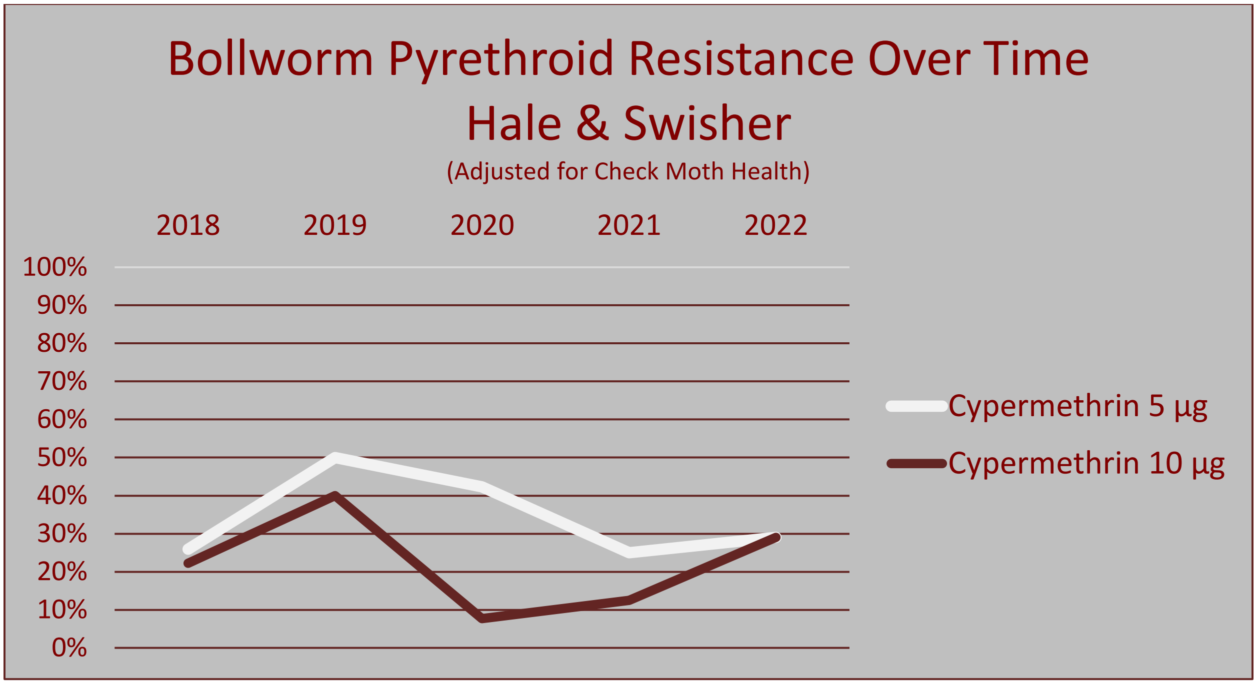


Figure 14. Percent moth survivorship over the past three years by treatment.

Conclusions

While the population available for testing in 2022 was light, and the results remain startling. The poor health of the population indicates that these moths likely migrated a great distance, experienced hardships, and limited food along the way, were exhausted upon arrival, and had little food available this late in the growing season. Despite the poor health of the test subjects, the adjusted survivorship from both rates indicate significant resistance in the bollworm population. If this population of worms had reached economic levels, only pyrethroids would have only been able to control 71% of the population in any treated crop. This is a slight increase in the level of resistance from the previous season. During the 2022 season, drought was a major issue for most cotton growing regions. This impacted both the bollworm population and the quality of the crops grown. Many producers in more consistent bollworm pressure regions did opt to treat their lower return potential fields with pyrethroids, likely causing this slight increase in resistance levels showing on the few moths that migrated onto the Texas High Plains.

These results also fall within the norm of other areas of the State tested. The survivorship of the 5 µg typically ranges between 10% and 60%. While no area neared the high end of the resistance spectrum, most areas did see an increase in resistance toward the end of the season due to the increased use of this class of pesticides. The best optimistic point of these results comes from the lack of a large rise in resistance levels. This could indicate that a return to susceptibility might be possible in future years if selection for pyrethroid resistance can continue to be avoided across the Cotton Belt.

In conclusion, a pyrethroid should not be considered the best option for a first choice economically triggered bollworm treatment on the Texas High Plains in 2022 or the near future for all crops. It also indicates that pyrethroids should not be removed as a control option permanently. If large scale use across the Cotton Belt can continue to be avoided, likely for several more growing seasons, the economic use pyrethroids could return through the lessening selection pressure on the pyrethroid resistance factors. This might be of paramount importance with fewer and fewer insecticides being labeled.

Acknowledgements

This work is supported by Crops Protection and Pest Management Competitive Grants Program [grant no. 2017-70006-27188 /project accession no. 1013905] from the USDA National Institute of Food and Agriculture. I would like to extend thanks to Mike Goss and Shane Berry for cooperating with us to gather this data. I would like to thank Cotton Incorporated for sponsorship of this work, Dr. David Kerns and the Texas A&M Department of Entomology for moth trapping supplies and the 2022 Plains Pest Management Field Scouts and Lab Technicians for data collection and labor associated with this trial: Brenden Adams and Denise Reed. Thank you all.

Auxin Spray Tip Impact on Early Season Thrips Control in West Texas Cotton 2020, 2021, and 2022

Texas A&M AgriLife Extension Service / Cotton Incorporated
Swisher County
Mike Goss and Jeremy Reed, Cooperators
Blayne Reed, EA-IPM Hale & Swisher and Dr. Suhas Vyavhare, District 2 Cotton Entomologist

Summary

Five treatments involving the auxin herbicides Enlist for Enlist cotton varieties or Enginia for Xtendimax cotton varieties, the insecticide Orthene, and the insecticide Bidrin were organized into a small plot completely randomized block design (CRBD) with four replications for all trials to evaluate the impact on thrips efficacy by spray tip type. These treatments were grouped into an application A and application B. Application A consisted of all treatments made with auxin approved spray tips. Application B consisted of a second treatment with medium flat fan spray tips. Treatment 1 was made with application A and Enlist or Enginia alone. Treatment 2 and 4 were made of application A with a mixed treatment of Enlist or Enginia and one of the select insecticides for thrips control. Treatment 3 and treatment 5 were made with application A with Enlist or Enginia alone, followed by treatment B with one of the selected insecticides alone. Orthene was utilized in treatment 2 and 3 while Bidrin was utilized in treatment 4 and 5. 0-5 thrips damage ratings were taken pretreatment, 3 DAT, 7 DAT, and 10 or 14 DAT. Yield in terms of lint pounds per acre were taken by treatment at the end of the season when possible.

For all trials, thrips damage ratings were significantly lower for all insecticide treatments, proving that the addition and mixing of insecticide to the over-the-top auxin herbicide with auxin spray tips has benefit in thrips control by at least by the 7 DAT check dates in all trial years. All insecticide treatments and applications proved to be significantly different from the UTC in lint yield also. Both of these differences proving value to mixing insecticide treatments with herbicide treatments. There were

no consistent significant differences between treatments for application A and B. The 2020 trial shown Orthene applied by application B superior in terms of damage rating by 10 DAT and other years shown a slight numeric trend indicating some lighter damage for both insecticides in application B. This same numeric trend was present with application B in lint yield, but no significant differences were found in yield between the applications or insecticide type. These results indicate there should be no inherent reason to recommend a separate treatment with differing spray tips for early season thrips control unless reinfestation occurs.

Objective

Evaluate the impact, if any, of the use of auxin herbicide recommended large droplet spray nozzle tips on thrips efficacy from joint broadcast herbicide with insecticide early season treatments in West Texas Cotton. This will determine if auxin herbicide and thrips insecticide treatments can be made in one mixed treatment or will need two separate treatments with two differing and specialized spray tips are needed to maintain early season thrips control.

Materials and Methods

Commercial cotton fields intended to be planted in Enlist cotton in central Swisher County belonging to Mike Goss Farms was selected to house this trial for 2020 and 2021. For the 2022 season, a field belonging to Reed Farms in southern Swisher was selected to house the trial.

The fields selected for these trials had a reliable source for migrating thrips to emerge from drying wheat to the cotton on several sides. In 2020 the field was planted on 6 May and in 2021 on 21 May with Mr. Goss' field planter with the Enlist variety PHY 490 W3FE without any insecticidal seed treatments at 52,000 seeds per acre. In 2022 the trial was planted on 19 May with Jeremy Reed's field planter with the line DP 1822XF. On 2 June and 8 June respectively the plots were lain out and alleys cut into Mike Goss' established field and on 4 June on Reed Farms. All plots on Mike Goss Farms were 4 30-

inch rows wide and 36 feet long in both years and Reed Farms plots were 4 40-inch rows and 30 feet long..

Five treatments involving the auxin herbicides Enlist or Enginia, the insecticide Orthene, and the insecticide Bidrin were organized into a small plot CRBD with four replications. These treatments were grouped into an application A and application B. Application A consisted of all treatments made with auxin approved spray tips and always included the auxin herbicide required by the appropriate cotton variety. Application B consisted of a second treatment with medium flat fan spray tips. Application A was applied to all plots (1-5) with treatment 1 (UTC), 3, and 5 being made with the auxin herbicide alone. Application A for treatment 2 and 4 was a mix of the auxin herbicide and a selected insecticide thrips control. Application B was made with medium flat fan nozzles and represented a second application of insecticide alone following application A and was applied to treatment 3 and 5. Orthene at 2.5 oz./ac. was mixed with Enlist for treatment 2 and in treatment 3 was applied alone in application B. Bidrin at 1.6 oz./ac. was mixed with Enlist for treatment 4 and in treatment 5 was applied alone in application B.

Trial Map Treatment Description

Trt	Code	Description
1	CHK	Untreated Check
2		Orthene with Auxin Tips 2.5 OZ WT/A;NIS 1 % V/V
3		Orthene with flat fan tips 2.5 OZ WT/A;NIS 1 % V/V
4		Bidrin with Auxin Tips 1.6 FL OZ/A;NIS 1 % V/V
5		Bidrin with flat fan tips 1.6 FL OZ/A;NIS 1 % V/V

Figure 1. 2022 Trial map highlighting showing all treatments used for all trials.

All sprays were made with a CO2 backpack sprayer at 16.2 GPA with a walking groundspeed of 2.5 MPH. All application A treatments were made with Enlist at 32 oz./ac. or 25.6 oz./ac. Enginia for the 2022 trials with the Auxin label approved TeeJet TTI, 02, H spray tips. All application B treatments were made with TeeJet 8002V (medium flat fan) spray tips. NIS at 1% V/V was added as a surfactant to all A and B applications. Treatments were made on 8 June in 2020, 9 June in 2021, and 4 June in 2022. Between all treatments, the backpack spray system was cleansed and made ready for the next application regime. Sprays began with application A for treatments 1, 3, and 5 (Auxin alone). Application A for treatments 2 and 4 (Enlist mixed with insecticides) began shortly following shortly after. Following the conclusion of all application A treatments, the spray system was cleansed, and spray tips were changed for application B. Once complete application B for treatment 3 was made (Orthene alone) and application B was made for treatment 5 (Bidrin alone) following another system cleansing.

Figure 2. CO2 backpack sprayer with auxin labeled tips making an application in cotton.

Thrips numbers were collected on these dates by harvesting 10 randomly selected plants from the middle 2 rows of each plot, by cutting them at the soil level, and directly placing them into labeled and individual plot mason jars containing 75% alcohol. These jars were transported to Dr. Suhas Vyavhare's Lab at the Texas A&M AgriLife Center in Lubbock where any thrips captured in the jars would be filtered out of the solution, cleaned, counted, and species identified under microscope at leisure. Issues at the Insect Lab existed in 2020 in filter screen size utilized for separating the thrips from the solution and the numbers of thrips from each plot were not valid or usable for this trial. Due to heavy rain events the population of thrips in 2021 was greatly reduced and damage ratings proved sufficient for the trial. The 2022 thrips data correlated directly to damage ratings, thus damage ratings were utilized as the standard control measure for all trial years.

Thrips damage ratings were taken from the plots pretreatment the date of treatment, and at the 3, 7, and 10 /14 DAT dates. This approved damage rating system utilizes a 0-5 numeric assignment of increasing damage given each plot by the on-site researcher who can make use of visual thrips damage differences down to a 0.5 increment level.

Figure 3. The 0-5 thrips damage rating scale visualized with examples of damage at these levels.

Notes were taken on weed control differences within the plots on a percent control basis for all check dates on all trials. In 2020, no yield data were taken due to a late season hail event seriously damaging the trial. In 2021, 1/1000th of an acre were hand harvested from each plot to represent yield from each plot with samples ginned at the Lubbock Cotton Improvement Lab at the Lubbock Texas A&M AgriLife and Research Center. In 2022, the High Plains Team revived the International model 95 2-row cotton stripper of Dr. Suhas Vyavhare's lab and whole plots were machine harvested with grab samples pulled from burr cotton and ginned again at the Lubbock Cotton Improvement Lab. All yield data were recorded and analyzed with lint pounds per acre reported.

Results and Discussion

2020

All plots rated a 3 damage level on the 0-5 damage rating system pretreatment on 8 June when the plant stages were just above the 1st true leaf stage. By the 3 DAT date, there still were no significant differences between treatments (*P*=0.5539). All treatments had dropped in damage rating, but all treatments including an insecticide were dropping numerically faster than the treatment with Enlist alone. In addition, the treatments made via application B (second treatment with insecticide alone) were numercally lower than those of application A that included an insecticide with Enlist.

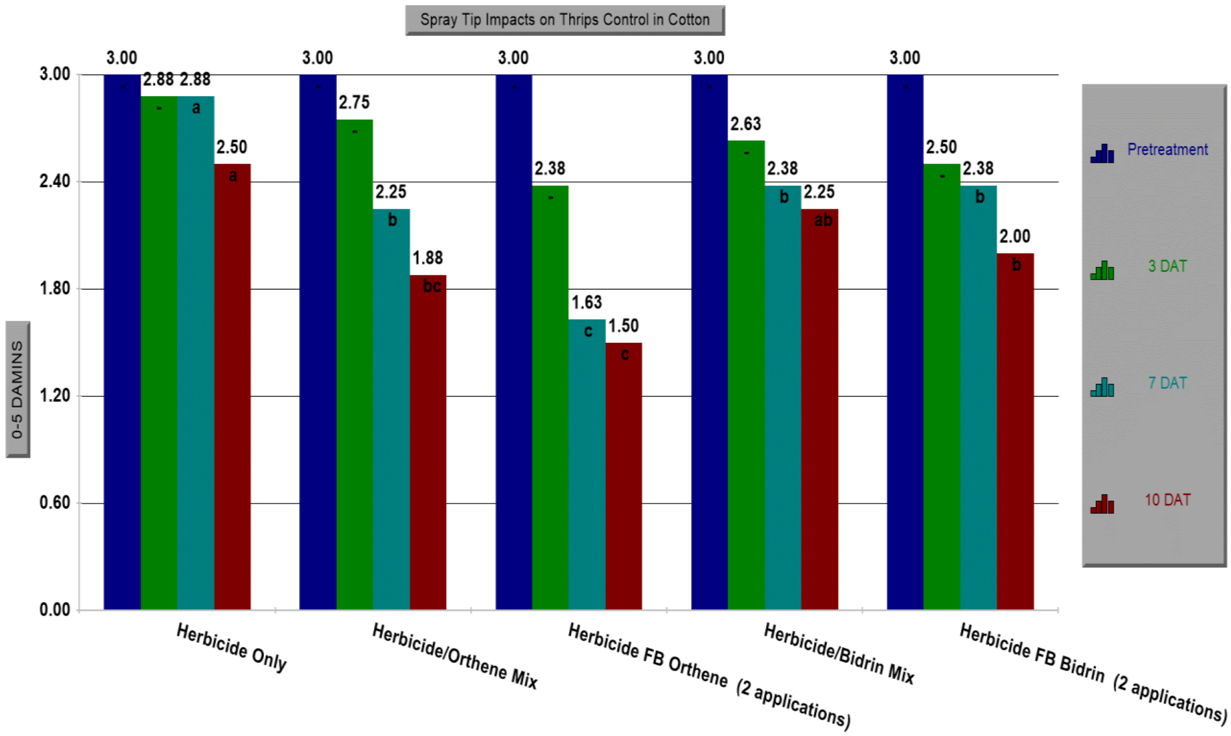


Figure 4. Damage ratings by treatment over time.

By the 7 DAT date, all treatments that included an insecticide treatment were performing better than the auxin alone or UTC treatment. In addition, treatment 3, with Orthene made as application B alone, was significantly superior to all other treatments (P=0.0006). By the 10 DAT date, treatment 4, the treatment that included a mix of Enlist and Bidrin mixed for application A, was no longer significantly different from treatment 1, Enlist alone. Treatment 3, Orthene alone as a second application B, was still numerically lower than all other treatments and was significantly lower in damage rating to all treatments except treatment 2, which mixed Orthene with Enlist for application A. Meanwhile, Treatment 5, Bidrin alone in application B, was numerically superior to treatment 4, Enlist and Bidrin mixed in application A.

2021

All treatments were superior to the UTC in terms of reduction in thrips damage at the 3 and 10 DAT dates. Treatment 3, the Orthene via application B, improved over treatment 2, the Orthene mixed with Auxin via application A, at the 3 and 10 DAT date. Treatment 5, the Bidrin via application B, separated from treatment 4, the Bidrin mixed with Auxin via application A, at the 10 DAT date only. Both of the application B treatments (3 and 5) were numerically superior to the applications with the Auxin spray tips for all check dates, but only significantly different for the check dates listed.

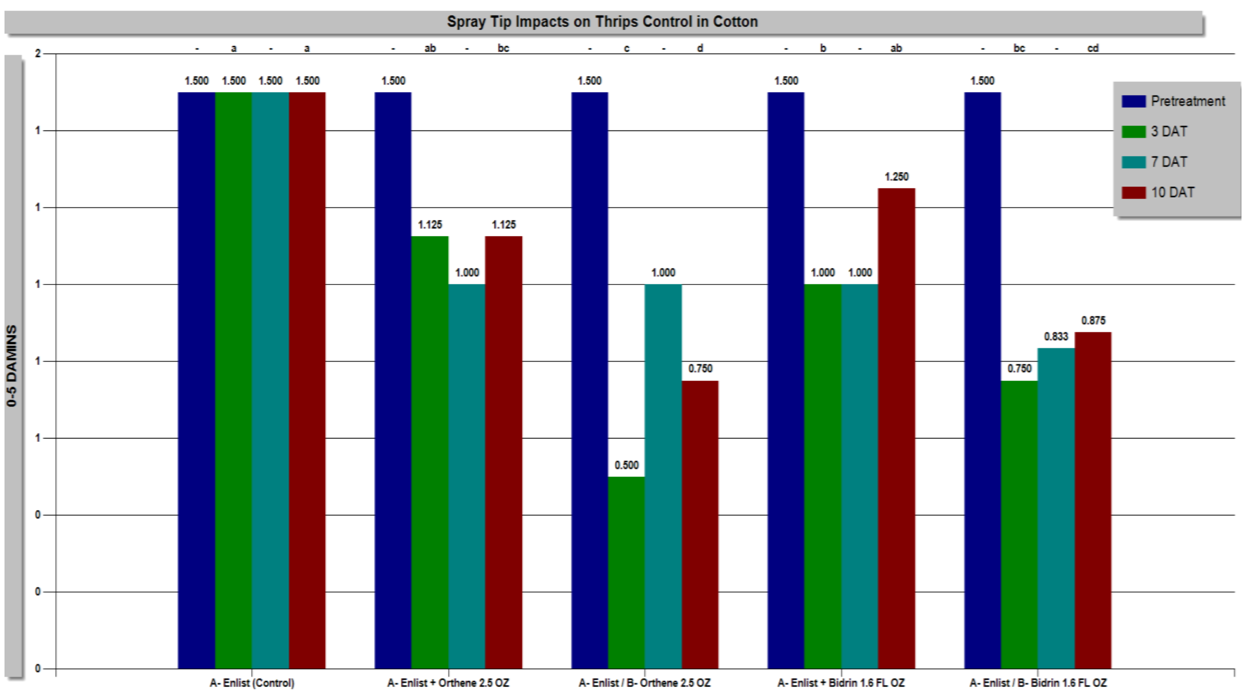


Figure 5. Thrips damage ratings from the 2021 trial.

2022

By the 7 DAT check date, all treatments with an insecticide were superior to the UTC or Enginia only treatment in terms of thrips damage rating. No application was statistically different nor were any insecticides different. The lone significant trend continued through the 14 DAT check date.

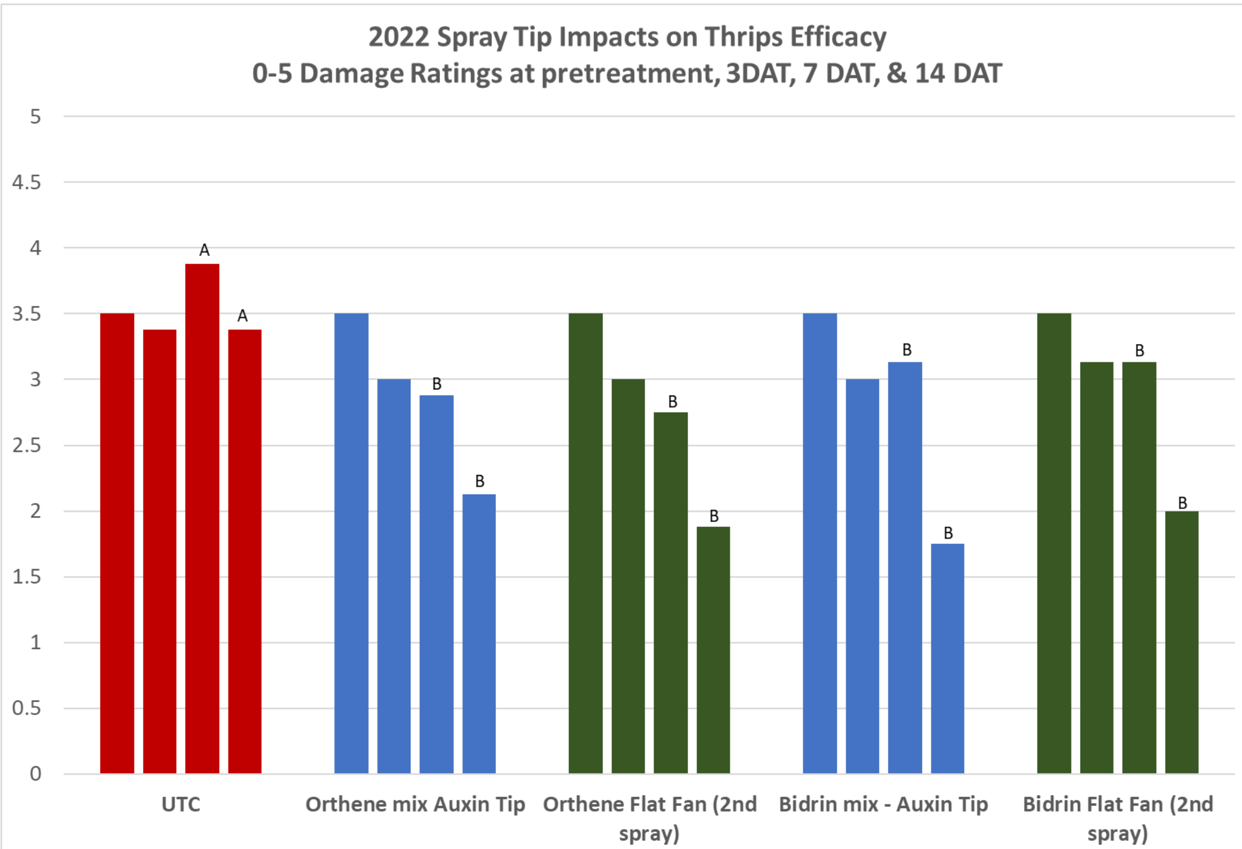


Figure 6. 2022 0-5 Damage ratings (P=0.0073, LSD=0.554) over time.

In terms of lint yield per acre, there were also no statistical differences between the treatments, but a strong numeric trend indicated that the treatments or applications that included any insecticide were superior. No other treatments differentiated but the slight numeric trend in favor of application B continued in the 2022 trial.

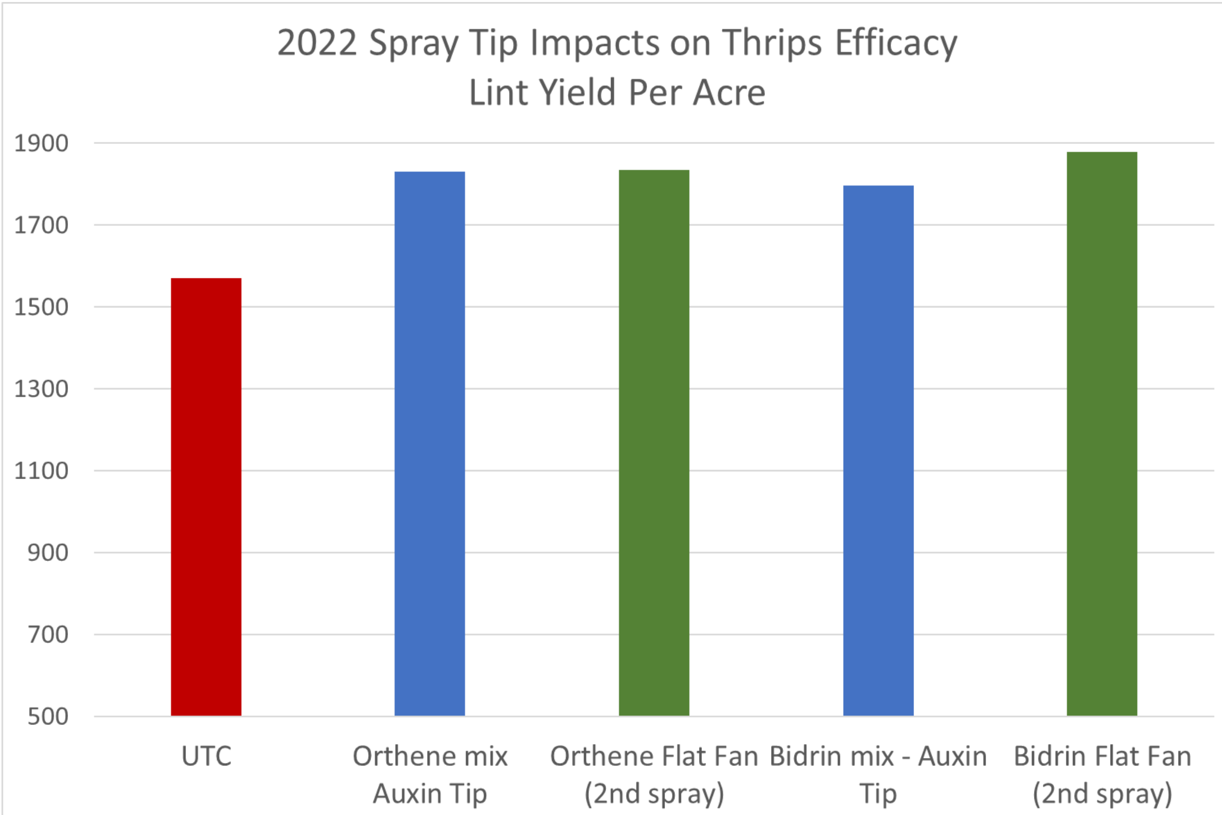


Figure 7. Lint yield per acre by treatment (P=0.6074, LSD= 449.348).

2020, 2021, 2022 Data Merged

Merging the data from all three years of the trial period did not find any additional significant differences. All insecticide treatments remained superior to the UTC in terms of thrips damage and in lint yield per acre, usually significantly. The application B spray tip application did not show any level of significance above application A despite the addition of merged data points although the numeric trend becomes more noticeable for both damage ratings and yield. There were still no significant differences between insecticide treatments either.

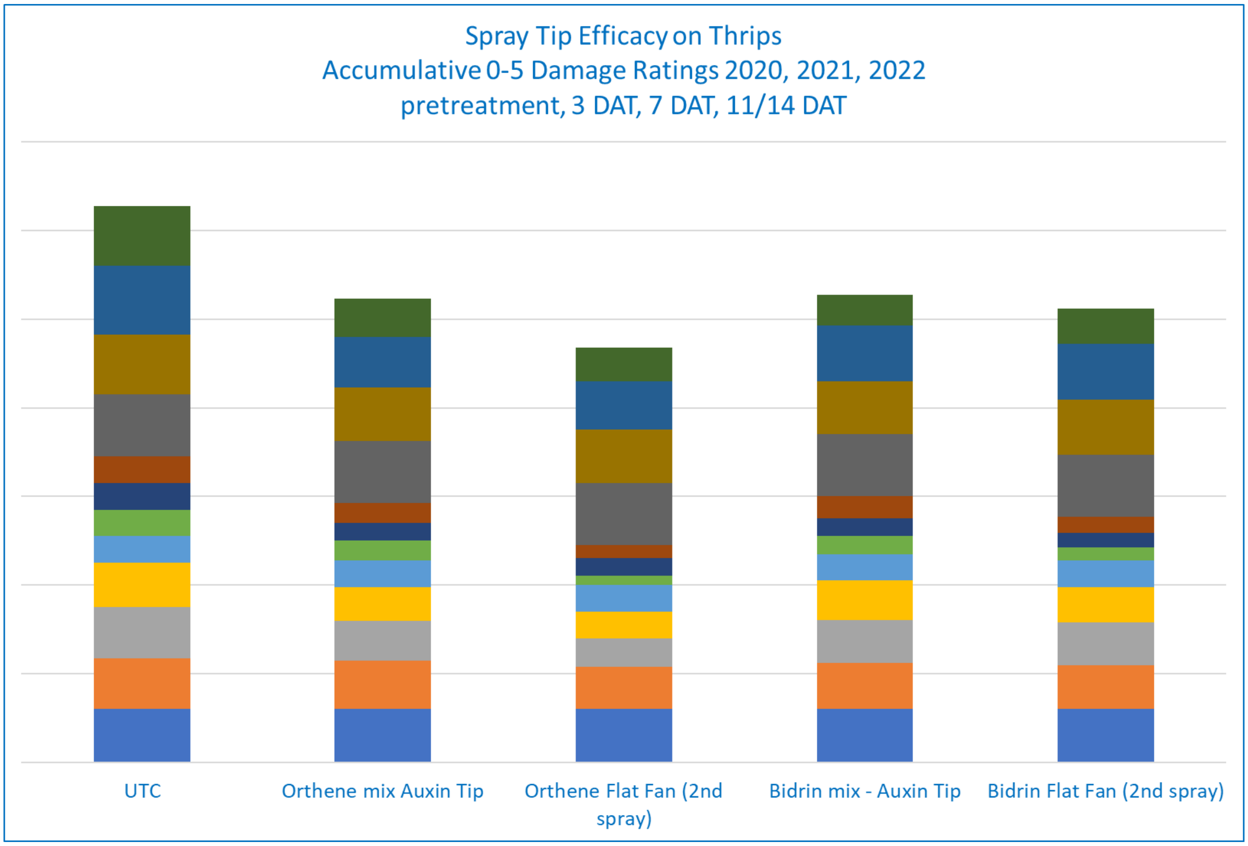


Figure 8. Total merged date and trial year 0-5 damage ratings by treatment.

Merged lint per acre yield data also did not discover any significant differences between applications. Numeric trends can still be noted with application B being slightly better, but these remain non-significant.

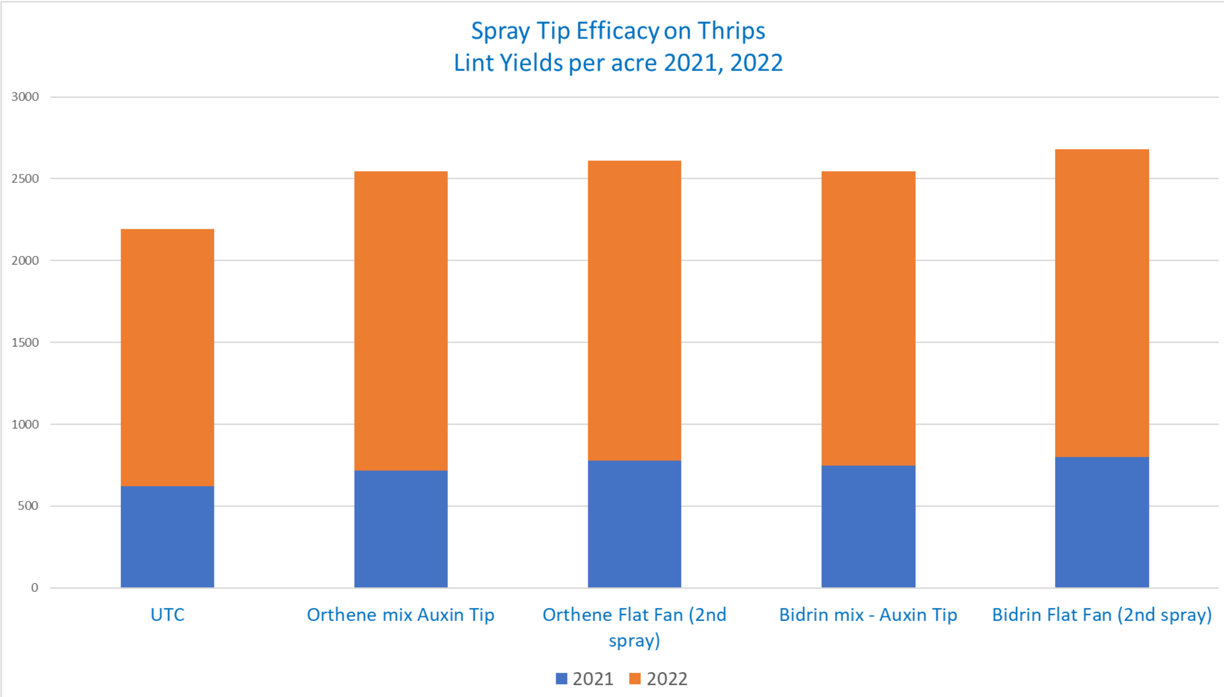


Figure 9. Merged lint yield per acre data by treatment for 2021 and 2022.

In terms of weed control, there were no differences between treatments for any year with all plots being rated at or near 100% control following application of treatment A.

Conclusions

It has shown that the practice of mixing insecticides for thrips control with Auxin herbicides while utilizing large droplet producing auxin approved spray tips is an economic treatment. There should be no need to change spray tips for thrips control on the Texas High Plains, if thrips are at threshold when the herbicide treatment needs to be applied. The numeric indication that flat fan tips might improve thrips control does hint that if a thrips treatment is needed while an auxin treatment is not needed, flat fans should be utilized. This hint of better control for thrips with smaller droplet spray tips would hold with all other trials involving droplet size and insect control. In fact the findings that the required larger droplet size nozzles are adequate to achieve thrips control is the oddity. As standard practice, smaller droplet size is required for coverage to achieve adequate pest control in all other cases.

Acknowledgements

This work is supported by Crops Protection and Pest Management Competitive Grants Program [grant no. 2017-70006-27188 /project accession no. 1013905] from the USDA National Institute of Food and Agriculture. I would like to extend thanks to Mike Goss and Jeremy Reed for cooperating with us to complete this trial, Cotton Incorporated for sponsoring and partnership of this trial, the Cotton Insect Lab for thrips counting and species analysis, the 2020, 2021, 2022 Plains Pest Management Interns and Lab Technicians for data collection and labor associated with this trial: Brenden Adams, Jerik Reed, Shawn Feagley, and Lauryn Carrol. Thank you all.

2022 Oberon Banks Grass Mite in High Plains Corn Efficacy Trial

Texas A&M AgriLife Extension Service / Bayer Crop Science
Cooperator: Jimmy Sageser
Blayne Reed, EA-IPM Hale & Swisher, John Thobe, EA-IPM Parmer, Bailey, Castro,
Russ Perkins, Bayer

Summary

Oberon 4SC and potential mixes of Oberon with available miticides were arranged into 8 treatments including an UTC. All treatments were organized into a small plot CRBD with four replications in a commercial corn field in southwestern Hale County. Plots were lain out on 26 July in one of the stronger pockets of BGM available in the field. All treatments were applied on 28 July with the CO2 backpack sprayer with the overhead boom attachment. Data on mites per zero leaf were recorded pre-treatment, 4, and 11 DAT. All data was then analyzed via ARM utilizing ANOVA and LSD of P=0.05 or less as a significance level.

By the 11 DAT count date, the high-rate Oberon alone, light-rate Oberon + full-rate Zeal, light-rate Oberon + full-rate Comite II, light-rate Oberon + light-rate Onager, and light-rate Oberon + full-rate Onager provided control for the BGM. No mixed treatment provided superior control compared to the full-rate Oberon. There should be no reason for the Southern High Plains at this time to mix Oberon with other miticides to add in improving control.

Objective

Oberon 4SC has been utilized for Banks grass mite control for many years, and as the only available and effective control product on the corn market for much of its early labeled career. Pest resistance concerns and the arrival of multiple other control options have led to the lowering of Oberon's use in mite control over time. Oberon's competitors have now also been on the market for a lengthy time and are currently experiencing resistance concerns. This trial was conducted to evaluate

Oberon's current efficacy and or pest resistance level following a period of lighter use and to determine potential miticide mixes of Oberon with other miticides that can offer the best control moving forward.

Materials and Methods

Plots for an 8-treatment trial were lain out on 26 July in one of the stronger population pockets of BGM available in a production pivot irrigated corn field of Jimmy Sageser in southwestern Hale County. The pocket of BGM were detected by the Plains Pest Management Field Scouting Program amongst a generally non-economic BGM field though weekly scouting duties. The use of a pocket of mites within a generally non-economic field helps prevent control over-sprays that could demolish trial results. All treatments were organized into a small plot CRBD with four replications. Plots were 4 rows wide and 40 feet long with the first 2 rows of each plot being the actual treatment area. Rows between the treated areas acted as a buffer to prevent spray drift between treatments while also offering a source for mite reinfestation. This source for mite reinfestation is intended to allow for an ultimate test of product viability and efficacy.

Figure 15. Returning from treating plots with CO2 sprayer.

On 27 July the pretreatment counts were made and treatments made On 28 July with the CO2 backpack sprayer with the overhead boom attachment at 16.2 GPA. Data on mites per leaf were recorded pre-treatment, 4, and 11 DAT. There were 8 labeled miticide treatments

Figure 2. Harvesting ear leaves from corn plots to be taken to lab and counted for BGM/leaf counts.

including an untreated check was organized for this trial. The Oberon alone treatment chosen was Oberon at 8 oz., while all mixed treatments included Oberon at 4 oz. The other components mixed with Oberon at 4 oz. were Portal at 32 oz., Zeal at 3 oz., Comite II at 36 oz., Onager at 12 oz., Comite II at 18 oz., and Onager at 6 oz.

For the mite per leaf counts, five randomly selected ear leaves were harvested from each plot on count dates and taken to the Plains Pest Management Insect Lab in Plainview where mites per leaf were counted under magnification. No differentiation was made about mite life stage as all living mites were counted. All data were recorded in ARM and following trial completion compared using ANOVA and LSD.

It should be noted that the field housing the trial experienced extreme heat stress from the 2022 extended drought situation that was heavily exacerbated when an irrigation well went down during the early count dates of this trial This left the field near desiccation levels as this trial progressed. Additional data, which included an intended 18 and 24 DAT counts and 24 DAT damage ratings, could not be taken due to field conditions. BGM populations were questioned for validity as they were so light and host plants desiccating rapidly. With significant differences found between treated and UTC plots, these results are viewed as reliable.

Results and Discussion

All pretreatment mites per zero leaf counts shown a fairly well distributed BGM population with no significant differences between plots or treatments. By the 4 DAT counts, significant differences were already found with the (in numerical order) Oberon + high-rate Onager, Oberon alone treatment, Oberon + Zeal, and Oberon + Onager light-rate treatments all performing superior to the UTC with some differences between treatments (*P*=0.0254, LSD=2.98). By the 11 DAT count the Oberon + Portal, and the Oberon + Commite II light-rate were not superior to the UTC but there were no differences between the treatments that separated from the UTC.

Table 1. ARM printout of BGM per zero leaf by count date over time.

Trt-Eval Interval				-1 DA-A	4 DA-A	11 DA-A
Trt No.	Treatment Name	Rate Rate Unit	Appl Code	1* dAL	2* dAL	3* dAL
1	Untreated Check		A	7.0 -	7.4 ab	12.5 a
2	Oberon 4SC	8 fl oz/a	A	9.0 -	2.8 cd	3.2 b
3	Oberon 4SC Portal	4 fl oz/a 32 fl oz/a	A A	7.7 -	4.5 a-d	6.7 a
4	Oberon 4SC Zeal SC	4 fl oz/a 3 oz wt/a	A A	7.5 -	3.5 cd	2.6 b
5	Oberon 4SC Comite II	4 fl oz/a 36 fl oz/a	A A	12.5 -	8.3 a	3.2 b
6	Oberon 4SC Onager	4 fl oz/a 12 fl oz/a	A A	5.5 -	3.8 bcd	1.4 b
7	Oberon 4 SC Comite II	4 fl oz/a 18 fl oz/a	A A	5.2 -	6.1 abc	7.8 a
8	Oberon 4 SC Onager	4 fl oz/a 6 fl oz/a	A A	5.7 -	2.5 d	2.4 b
LSD P=.05				9.07 - 12.78	2.98 - 4.28	1.93 - 5.99
Standard Deviation				0.33t	0.18t	0.17t
CV				35.89t	24.65t	24.46t
Levene's F^				1.054	2.427	0.955
Levene's Prob(F)				0.422	0.05*	0.485
Skewness^				-0.5051	0.1481	0.4579
Kurtosis^				0.0027	-0.1926	-0.1367
Replicate F				0.261	3.947	9.380
Replicate Prob(F)				0.8525	0.0223	0.0004
Treatment F				0.452	2.957	8.459
Treatment Prob(F)				0.8574	0.0254	0.0001

Conclusions

The results of this trial indicate that Oberon, at full labeled rates, should again be considered as effective in BGM control as most other labeled miticides. Combining Oberon at a lower rate with both full and light rates of Onager, full rates of Zeal, and Comite II also provides solid control but not superior to Oberon alone. The mixing of these miticides could prove useful if mite resistance issues to all labeled products worsens in the future.

Acknowledgements

This work is supported by Crops Protection and Pest Management Competitive Grants Program [grant no. 2017-70006-27188 /project accession no. 1013905] from the USDA National Institute of Food and Agriculture. I would like to extend thanks to our cooperating producer Jimmy Sageser for working with us to gather this data, BCS for sponsoring this trial, and John Thobe, EA-IPM Parmer, Bailey, and Castro for partnering in this work. I would like to thank the 2022 Plains Pest Management Interns for data collection and labor associated with this work: Brenden Adams and Denise Reed. Thank you all.

2022 Portal Formulation Efficacy Trial on BGM in Corn

Texas A&M AgriLife Extension Service / Nichino
Cooperator: Jimmy Sageser
Blayne Reed, EA-IPM Hale & Swisher, John Thobe, EA-IPM Parmer, Bailey, Castro,
Milo Lewis, Nichino

Summary

Portal at a low labeled rate and a high labeled rate were compared to the local industry standard for BGM control, a high rate of Onager, in a 4-treatment trial including an UTC. All treatments were organized into a small plot CRBD with four replications in a commercial corn field in southwestern Hale County. Plots were lain out on 26 July in one of the stronger pockets of BGM available in the field. All treatments were applied on 28 July with the CO2 backpack sprayer with the overhead boom attachment. Data on mites per zero leaf were recorded pre-treatment, 4, and 11 DAT. All data was then analyzed via ARM utilizing ANOVA and LSD of *P*=0.05 or less as a significance level.

By the 11 DAT count all treatments were superior to the UTC (*P*=0.0037, LSD=3.13) but no treatment was statistically different from each other. The revisited formulation of Portal has proven to have equal efficacy for BGM on the High Plains corn to the local standard treatment at both the high and low rates. This Portal formulation should be considered a viable option for BGM control on TPH corn

Objective

Gain current efficacy knowledge on field BGM populations in corn now that Nichino had reverted the Portal formulation back from the recently labeled and available Portal XLO.

Materials and Methods

Plots for a 4-treatment trial were laid out on 26 July in one of the stronger population pockets of BGM available in a production pivot irrigated corn field of Jimmy Sageser in southwestern Hale County. The pocket of BGM, detected by the Plains Pest Management Field Scouting Program amongst a generally non-economic BGM field though weekly scouting duties.


Figure 16. Returning from treating plots with CO2 sprayer.

The use of a pocket of mites within a generally non-economic field helps prevent control over-sprays that could demolish trial results. All treatments were organized into a small plot CRBD with four replications. Plots were 4 rows wide and 40 feet long with the exception of the 4th rep which was 32 feet long due to physical obstacles in the field. The first 2 rows of each plot were the actual treatment area. Rows between the treated areas acted as a buffer to prevent spray drift between treatments while also offering a source for mite reinfestation. This source for mite reinfestation is intended to allow for an ultimate test of product viability and efficacy.

On 27 July the pretreatment counts were made and treatments made on 28 July with the CO2 backpack sprayer with the overhead boom attachment at 16.2 GPA. Data on mites per leaf were recorded pre-treatment, 4, and 11 DAT. The 4 labeled miticide treatments for this trial were Portal at 24 oz., Portal at 32 oz., and Onager at 16 oz., with the UTC.

For the mite per leaf counts, five randomly selected ear leaves were harvested from each plot on count dates and taken to the Plains Pest Management Insect Lab in Plainview where mites per leaf were counted under magnification. No differentiation was made about mite life stage as all living mites were counted. All data were recorded in ARM and following trial completion compared using ANOVA and LSD.

It should be noted that the field housing the trial experienced extreme heat stress from the 2022 extended drought situation that was heavily exacerbated when an irrigation well went down during the early count dates of this trial This left the field near desiccation levels as this trial progressed. Additional data, which included an intended 18 and 24 DAT counts and 24 DAT damage ratings, could not be taken due to field conditions. BGM populations were questioned for validity as they were so light and host plants desiccating rapidly. With significant differences found between treated and UTC plots, these results were viewed as viable.

Figure 17. Counting BGM per zero leaf at the PPM lab in Plainview.

Results and Discussion

All pretreatment mites per zero leaf counts shown a fairly well distributed BGM population with no significant differences between plots or treatments. No significant differences were found on the 4 DAT count date, but numeric trends were starting to be noted toward control by all treatments. By the 11 DAT count all treatments were superior to the UTC (*P*=0.0037, LSD=3.13) but no treatment was statistically different from each other.

Table 2. ARM printout of BGM per zero leaf by count date over time.

Trt-Eval Interval ARM Action Codes				-1 DA-A &AL	4 DA-A &AS	11 DA-A AS
Trt No.	Treatment Name	Rate Rate Unit	Appl Code	1* d&AL	2* d&AS	3* dAS
1	Untreated Check		A	3.6 -	7.0 -	9.7 a
2	Portal @ 24	24 fl oz/a	A	10.6 -	5.3 -	2.0 b
3	Portal @ 32	32 fl oz/a	A	5.1 -	2.5 -	1.8 b
4	Onager	16 fl oz/a	A	4.9 -	3.5 -	2.9 b
LSD P=.05				8.68 - 13.94	5.02 - 5.40	3.13 - 4.53
Standard Deviation				0.38t	0.73t	0.51t
CV				45.82t	32.77t	25.06t
Levene's F^				0.709	0.80	2.052
Levene's Prob(F)				0.565	0.517	0.16
Skewness^				1.0065	0.7113	-0.2372
Kurtosis^				1.1999	0.1072	-0.0114
Replicate F				3.971	0.262	4.391
Replicate Prob(F)				0.0468	0.8510	0.0365
Treatment F				0.812	1.461	9.554
Treatment Prob(F)				0.5188	0.2893	0.0037

Conclusions

The revisited formulation of Portal has proven to have equal efficacy on BGM on the Texas High Plains corn to the local standard treatment at both the high and low rates. This is an improvement above the Portal XLO, which historically could perform statistically equal but numerically inferior in some trials but could also show inferior control in others. These results place Portal back into the conversation for miticide options on the Texas High Plains as MOA rotation reaches peak need for mite control in corn.

Acknowledgements

This work is supported by Crops Protection and Pest Management Competitive Grants Program [grant no. 2017-70006-27188 /project accession no. 1013905] from the USDA National Institute of Food and Agriculture. I would like to extend thanks to our cooperating producer Jimmy Sageser for working with us to gather this data, BCS for sponsoring this trial, and John Thobe, EA-IPM Parmer, Bailey, and Castro for partnering in this work. I would like to thank the 2022 Plains Pest Management Interns for data collection and labor associated with this work: Brenden Adams and Denise Reed. Thank you all.

Economic Evaluation of Brown and Wheat Curl Mites Management and Experimental Control Product Efficacy in Texas High Plains Wheat

Texas A&M AgriLife Extension Service

Hale & Swisher County

Cooperator: Mike Goss

Blayne Reed[1], Dr Pat Porter[2], Dr. Suhas Vyavhare[2], John Thobe[3]

1. Plainview, 2. Lubbock, 3. Muleshoe

Summary

Extremely heavy wheat curl mite populations infested drought stressed the spring 2022 wheat. While not listed as a known pest of THP wheat, desperate producers sought products to lessen the pressure on the desiccating wheat by controlling the high mite populations. Recent loss of a labeled product and arbitrary shortness of supply for another lead to multiple agricultural corporations testing experimental products for efficacy on the mite. Two experimental products with potential to control the mite were organized in to two separate small plot, replicated trials alongside the industry standard, Dimothoate and an UTC. Mite counts were made pretreatment, 3, 9/10, and 17 (when applicable) were made and all agronomic and potential yield benefits from all treatments were measured for economic viability.

Dimethoate and the high rate of the second experimental product offered significant control of the mite but obtaining control of the mite proved to be unnecessary. No benefits were found in controlling the wheat curl mite on the THP, even under extreme or heavy population pressure. The wheat curl mite should only be considered a pest of Texas wheat as a disease vectoring pest, and not a secondary feeding damage pest.

Objective

1. To re-evaluate the economic viability of managing wheat under drought conditions for high populations of wheat curl mites through chemical treatments.
2. Evaluate multiple experimental compounds for efficacy on wheat curl mites in field conditions on the Texas High Plains for potential labeling.

Materials and Methods

A central Swisher commercial wheat field belonging to Mike Goss was identified as representing an area wide situation undergoing severe drought stress situations while housing high numbers of wheat curl mites. The 2022 situation seemed exceptionally dire due to the loss of known labeled and efficacious insecticides for these species while another known insecticide, Dimethoate, was experiencing an arbitrary shortage. Multiple corporate parties were interested in evaluating their products for potential efficacy to this species in wheat to address a region wide situation and lead toward potential labeling of the respective products.

Figure 18. The backpack CO2 sprayer in use in wheat.

Two small plot efficacy trials were initiated in quick succession following separate company protocol approval. All unlabeled or experimental wheat products evaluated are labeled for other crops but had not been tested on this species. Questions still arouse about the economic impact of treating these drought only appearing species of mites when previous research indicated that they did little if any noticeable economic damage and careful data was taken to better evaluate the economic impact of the pest on Texas High Plains wheat.

Both trials were organized with 4 treatments including an UTC, experimental product at a proposed low and high rate, and a standard rate of Dimethoate 400EC as an industry standard comparison. The first trail was placed, and treatments made on 7 April with the PPM backpack CO^2 sprayer at 32 psi applying 16.2 GPA. Pretreatment mite and beneficial species counts were taken at 3, 10, and 17 DAT by utilizing boarded paper to drop cloth count 3 subsamples of 1 planted row foot. The second trial was placed about 75 yeads east of the first and treatments made on 27 April with the same CO^2 backpack sprayer and calibrations. Counts were taken for both mites and beneficials by the same methods but at pretreatment, 3, and 9 DAT.

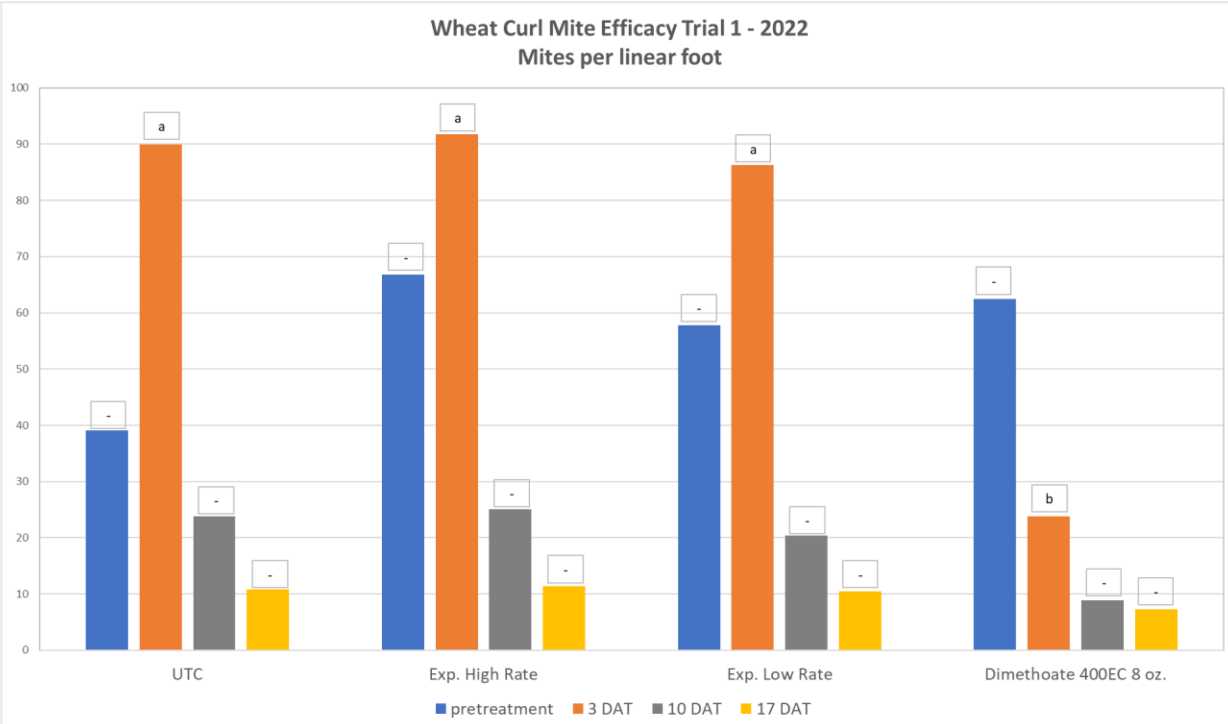
Figure 19. Measuring wind and temperature at the trial site before making the treatment applications.

At each count date plant health, phytotoxicity, and agronomic benefits of treatments were evaluated and again at bloom and dry down stages by multiple metrics including plant height, visual inspection, head size, and yield.

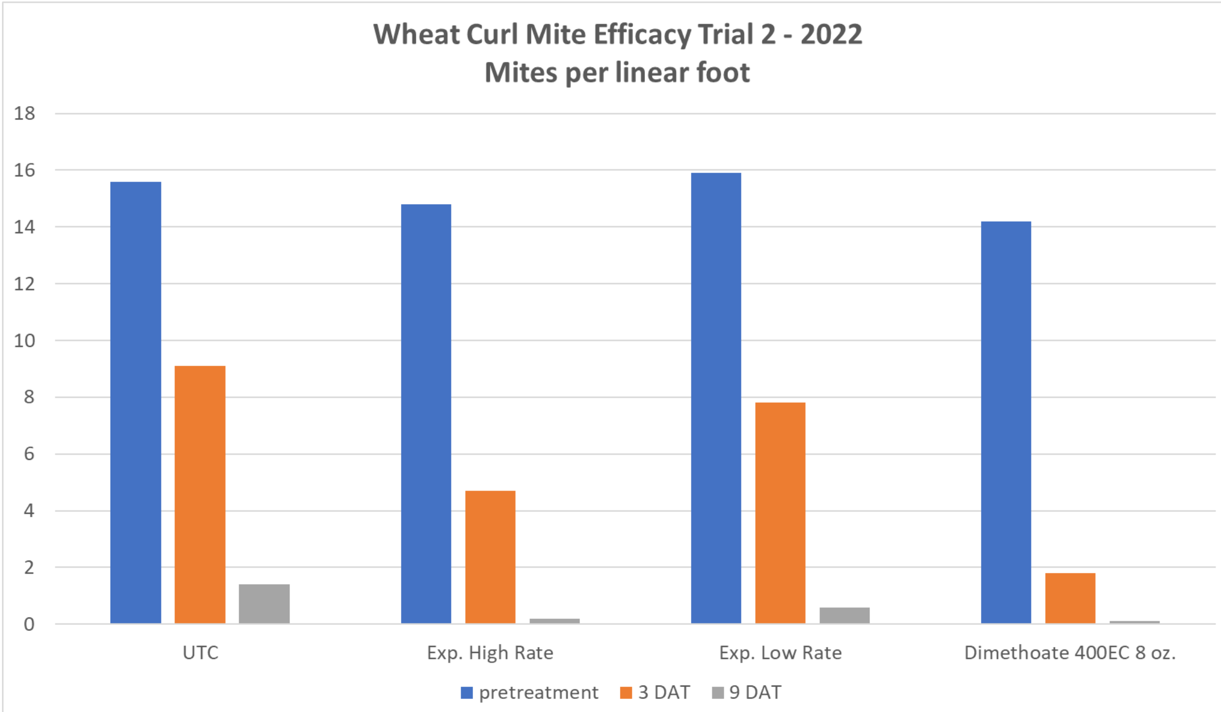
Results and Discussion

For the first trial, pretreatment mite counts ranged from 39.1 – 66.8 mites per linier row foot with no significant differences. By the 3 DAT count, the industry standard Dimethoate treatment, with 23.8 mites per linier foot was statistically superior to all other treatments. No other treatment being significantly different from the UTC (*P*=0.0042, LSD=34.57) with all treatments increasing in mites to 86.8 to 91.8 mites per linier foot. Mite populations decreased rapidly for the 10 and 17 DAT count dates following an irrigation event and a light 0.31-inch rain, both occurring in the test plots at 9 DAT. The Dimethoate treatment, while not significant any longer, maintained a numerical superiority to all other treatments, which looked to remain almost identical for the duration of the trial.

At no time or by any metric did any agronomic or yield measurement prove to be significant nor did any treatment numerically segregate.



By the start of the pretreatment count for the second trial, the mite numbers had decreased to a range of 14.2 – 15.6 mites per linier foot. Despite treatment differences, all mite populations continued to decline through the end of the second trial. At the 3 DAT count date, all treatments separated from each other. Dimethoate again shown to be significantly superior to all treatments with only 1.8 mites per foot. The high rate of the second experimental product then held 4.7 mites per foot while the low rate held 7.8 and the UTC held 9.1. Differences in select treatments continued through the 9 DAT count with the Dimethoate treatment holding only 0.1 mites per foot. The high rate of the experimental product was statistically similar to the Dimethoate treatment at 0.2 mites per foot while the low rate remained significantly better than the UTC with 0.6 mites and the UTC holding only 1.4.



At no time or by any metric did any agronomic or yield measurement prove to be significant nor did any treatment numerically segregate for either trial.

Conclusions

The most important malleable fact resulting from these trials, is that there was no significant benefit from treating wheat curl mites in either trial. It appears that there should not be any reason to treat wheat for this pest regardless of population. While this was an established IPM thought regarding the mite, it was not believed to have ever been tested under the extremely high populations that were present at the start of the first trial.

Dimethoate did provide significant control, and to a lesser extent, the second experimental product did provide some level of control. However, there should be no reason for the makers of this product to seek labeling for control of this pest. It is concluded that wheat curl mite may be considered a pest in wheat only for any disease vectoring issue occurring during the fall, and not an issue during the spring developmental time. It is assumed that mite feeding in the spring could be similar to thrips and can easily be compensated for as long as wheat has moisture available.

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